Final
Site Investigation
Site-Specific Field Sampling Plan, Site-Specific Safety and Health Plan, and Site-Specific Unexploded Ordnance Safety Plan Attachments for Chemical Warfare Material Sites – Agent ID Area (Parcel 509), Training Area T-6 (Naylor Field) (Parcel 183), Blacktop Training Area (Parcel 511), Fenced Yard in Blacktop Area (Parcel 512), Dog Training Area (Parcel 513), Dog Kennel Area (Parcel 516), Training Area T-5 (Parcel 182), Former Detection and Identification Area (Parcel 180), Old Burn Pit (Parcel 514), CBR Proficiency Area (Parcel 517), and Old Toxic Training Area (Parcel 188)

Fort McClellan
Calhoun County, Alabama

Delivery Order CK10
Contract No. DACA21-96-D-0018
IT Project No. 796887

October 2000

Final
Site Investigation
Site-Specific Field Sampling Plan Attachment for Chemical Warfare Material Sites – Agent ID Area (Parcel 509), Training Area T-6 (Naylor Field) (Parcel 183), Blacktop Training Area (Parcel 511), Fenced Yard in Blacktop Area (Parcel 512), Dog Training Area (Parcel 513), Dog Kennel Area (Parcel 516), Training Area T-5 (Parcel 182), Former Detection and Identification Area (Parcel 180), Old Burn Pit (Parcel 514), CBR Proficiency Area (Parcel 517), and Old Toxic Training Area (Parcel 188)

Fort McClellan
Calhoun County, Alabama

Prepared for:

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Executive Summary

In accordance with Contract Number DACA21-96-D-0018, Delivery Order CK10, IT Corporation (IT) will conduct sampling and analysis activities associated with a site investigation (SI) at 11 chemical warfare material (CWM) hazardous, toxic, and radioactive waste sites at Fort McClellan (FTMC), Calhoun County, Alabama to determine the nature and extent of contamination to warrant corrective measures at these sites. The CWM sites that this SI will investigate are the following:

- Agent ID Area (Parcel 509[7])
- Training Area T-6 (Naylor Field) (Parcel 183[6])
- Blacktop Training Area (Parcel 511[7])
- Fenced Yard in Blacktop Area (Parcel 512[7])
- Dog Training Area (Parcel 513[7])
- Dog Kennel Area (Parcel 516[7])
- Training Area T-5 (Parcel 182[7])
- Former Detection and Identification Area (Parcel 180[7])
- Old Burn Pit (Parcel 514[7])
- Chemical, Biological, and Radioactive Proficiency Area (Parcel 517[7])
- Old Toxic Training Area (Parcel 188[7]).

Prior to IT conducting any field work at these sites, the U.S. Army Corps of Engineers (USACE)-Huntsville will clear the sites for CWM. Therefore, data related to CWM will not be collected as part of this SI. A CWM investigation will be provided in the CWM engineering evaluation/cost analysis that is being proposed by USACE-Huntsville.

The purpose of this site-specific sampling and analysis plan is to provide technical guidance for sampling and analysis activities at the CWM sites. These CWM sites are located in the center area of the Main Post. Specifically, IT will collect 43 surface soil samples, 43 subsurface soil samples, 41 groundwater samples, 17 surface water samples, and 17 sediment samples at the CWM sites. Chemical analyses of the samples collected during the field program will include volatile organic compounds, semivolatile organic compounds, metals, and CWM breakdown products. In addition, sediment samples will be analyzed for total organic carbon and grain size. Results from these analyses will be compared with site-specific screening levels presented in the IT July 2000 *Final Human Health and Ecological Screening Values and PAH Background Summary Report* and regulatory agency guidelines.

A USACE-Huntsville requirement for conducting work at the CWM sites at FTMC is to use unexploded ordnance (UXO) anomaly avoidance techniques; therefore, UXO surface sweeps and downhole surveys of soil borings will be required to support field activities at the CWM sites. The surface sweeps and downhole surveys will be conducted to identify anomalies for the purposes of UXO avoidance.

The site-specific field sampling plan attachment to the installation-wide sampling and analysis plan (SAP) for the CWM sites will be used in conjunction with the site-specific safety and health plan, the site-specific UXO safety plan, the installation-wide work plan, and the SAP. The SAP includes the installation-wide safety and health plan, waste management plan, ordnance and explosives management plan, and quality assurance plan. Site-specific hazard analyses are included in the site-specific safety and health plan and the site-specific UXO safety plan.

1.0 Project Description

1.1 Introduction

The U.S. Army is conducting studies of the environmental impact of suspected contaminants at Fort McClellan (FTMC) in Calhoun County, Alabama, under the management of the U.S. Army Corps of Engineers (USACE)-Mobile District. The USACE has contracted IT Corporation (IT) to provide environmental services for the site investigation (SI) of 11 chemical warfare material (CWM) sites, Parcels 509(7), 183(6), 511(7), 512(7), 513(7), 516(7), 182(7), 180(7), 514(7), 517(7), and 188(7), under Delivery Order CK10, Contract Number DACA21-96-D-0018.

This site-specific field sampling plan (SFSP) attachment to the installation-wide sampling and analysis plan (SAP) (IT, 2000a) for FTMC has been prepared to provide technical guidance for sample collection and analysis to complete an SI at the 11 CWM sites. This SFSP will be used in conjunction with the site-specific safety and health plan (SSHP) and the site-specific unexploded ordnance (UXO) safety plan developed for this SI at the CWM sites, and the installation-wide work plan (WP) (IT, 1998) and SAP. The SAP includes the installation-wide safety and health plan (SHP), waste management plan, ordnance and explosives management plan, and quality assurance plan (QAP). Site-specific hazard analyses are included in the SSHP and the site-specific UXO safety plan.

1.2 FTMC Site Description and History

FTMC is located in the foothills of the Appalachian Mountains of northeastern Alabama near the cities of Anniston and Weaver in Calhoun County. The post is approximately 60 miles northeast of Birmingham, 75 miles northwest of Auburn, and 95 miles west of Atlanta, Georgia. FTMC consists of three main areas of government-owned and leased properties: Main Post, Pelham Range, and Choccolocco Corridor (leased). The lease for the Choccolocco Corridor was terminated in May 1998. The size of each property is presented below:

- Main Post 18,929 acres
- Pelham Range 22,245 acres
- Choccolocco Corridor (leased) 4,488 acres.

The Main Post is bounded on the east by the Choccolocco Corridor, which connects the Main Post with the Talladega National Forest. Pelham Range is located approximately 5 miles west of

the Main Post and adjoins the Anniston Army Depot on the southwest. Pelham Range is bordered on the east by U.S. Highway 431.

FTMC is under the jurisdiction of the U.S. Army Training and Doctrine Command. The installation housed three major organizations including the U.S. Army Military Police School, the U.S. Army Chemical School, and the Training Center (under the direction of the training brigade), in addition to other major support units and tenants.

The U.S. government purchased 18,929 acres of land near Anniston in 1917 for use as an artillery range and a training camp due to the outbreak of World War I. The site was named Camp McClellan in honor of Major General George B. McClellan, a former leader of the Union Army during the Civil War. Camp McClellan was used to train troops for World War I from 1917 until the armistice. It was then designated as a demobilization center. Between 1919 and 1929, Camp McClellan served as a training area for active army units and other civilian elements. Camp McClellan was redesignated as FTMC in 1929 and continued to serve as a training area.

In 1940, the government acquired an additional 22,245 acres west of FTMC. This tract of land was named Pelham Range. In 1941, the Alabama Legislature leased approximately 4,488 acres to the U.S. government to provide an access corridor from the Main Post to Talladega National Forest. This corridor provided access to additional woodlands for training. The lease for the 4,488 acres (Choccolocco Corridor) was terminated in May 1998.

The U.S. Army operated the Chemical Corps School at FTMC from 1951 until the school was deactivated in 1973. The Chemical Corps School offered advanced training in all phases of chemical, biological, and radiological warfare to students from all branches of the military service.

FTMC was officially closed in September 1999. A portion of the Main Post has been added to the City of Anniston and another portion is scheduled to be transferred to the Department of Justice and the Alabama National Guard. The remainder of the Main Post is retained by the U.S. Army, who is administering to the property.

Recent activities at FTMC can be divided into support activities, academic training, and practical training. Support activities included housing, food services, and troop transportation during training. Academic training included classroom, laboratory, and field instruction. Practical training included weapons, artillery and explosives, vehicle operation and maintenance, and physical and tactical training activities.

1.3 CWM Site Descriptions

The CWM sites, Parcels 509(7), 183(6), 511(7), 512(7), 513(7), 516(7), 182(7), 180(7), 514(7), 517(7), and 188(7), are located in the southeast area of the Main Post (Figures 1-1 and 1-2). The individual CWM sites to be investigated as part of this SI are described below.

Agent ID Area, Parcel 509(7). The Agent ID Area, Parcel 509(7) comprises approximately 1.2 acres within the Main Post at FTMC (Figure 1-3). The site is located west of 8th Avenue at the athletic field. Little is known about the history of this site with respect to any CWM-related activities. This area was identified on the 1969 Orientation Map of the Chemical Corps Student Guide (USACE, 1999a). Analysis of the historical aerial photographs shows that a great deal of activity has occurred at this area over the years (Parsons Engineering Science, Inc. [Parsons], 1999). This is to be expected, however, based on the area's central location on base. There is not any evidence observed in the photographs that indicates potential burial areas (Parsons, 1999). A site visit to this area in February 1999 by Parsons showed the area to be in an athletic field with an oval 400-meter running track on part of the area. There was not any evidence of burial at the surface observed during the site visit (Parsons, 1999).

Training Area T-6 (Naylor Field), Parcel 183(6). Training Area T-6 (Naylor Field), Parcel 183(6) is a heavily wooded area located at the base of the eastern slope of Howitzer Hill, about 300 feet southwest of the intersection of 23rd Street and 10th Avenue, and west of South Branch of Cane Creek (Figure 1-4) (Parsons, 1999). Training Area T-6 was used from an unknown date prior to 1954 until 1973. Historically, it was called the Howitzer Hill Decontamination Area or the Former Agent Decontamination Training Area. The site encompasses about 10 acres. The area was fenced and posted; however, the site is accessible due to breaks in the fence because of age and lack of maintenance. The area contained eight training sites that consisted of concrete pads on which equipment was parked, and a network of drainage ditches that may have drained to a shallow pond (Parsons, 1999). Only four concrete pads were located during a February 1999 site visit by Parsons (Parsons, 1999). Numerous drainage ditches were also located in the area surrounding the pads and were believed to have been used to drain

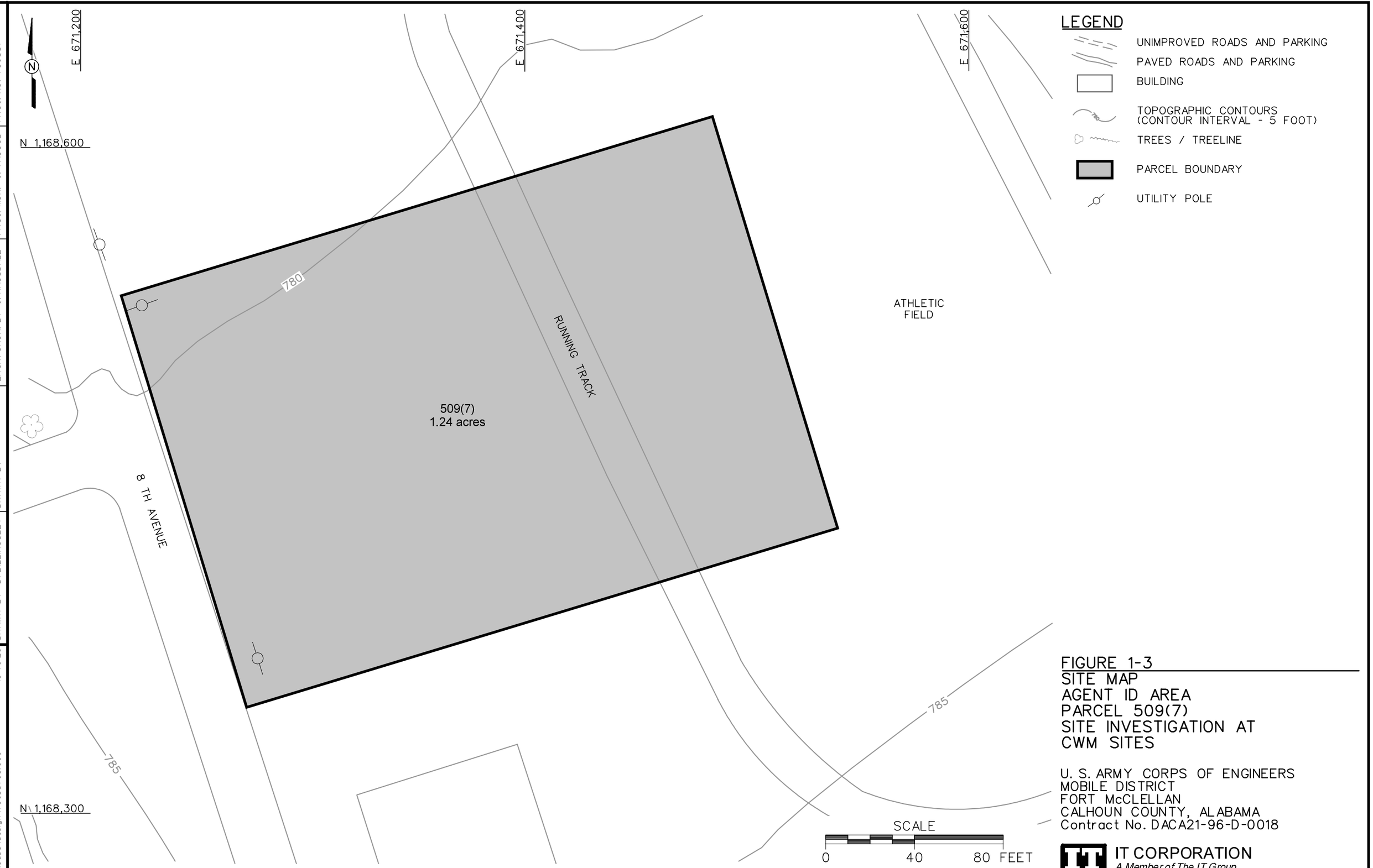

FIGURE 1-3
SITE MAP
AGENT ID AREA
PARCEL 509(7)
SITE INVESTIGATION AT
CWM SITES

U. S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

IT CORPORATION
A Member of The IT Group

DWG. NO.: ...\796887es.006	INITIATOR: J. RAGSDALE	DATE LAST REV.:	
PROJ. NO.: 796887	PROJ. MGR.: J. YACOUB	DRAWN BY:	
DRAFT. CHCK. BY:	STARTING DATE: 12/14/99		
ENGR. CHCK. BY: J. RAGSDALE	DRAWN BY: D. BILLINGSLEY		
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liquids from the pads to a shallow open pond. The pond area was not visible during Parsons site visit. There was not any evidence of burial sites at the time of Parsons' site visit (Parsons, 1999). A site visit by IT in August 2000 also did not reveal any evidence of burial sites.

The training activities conducted reportedly involved the decontamination of various CWMs including distilled mustard (HD), lewisite, and sarin (GB), as well as the decontamination solutions supertropical bleach (STB), decontamination agent, noncorrosive (DANC), and Decontamination Solution Number 2 (DS2) (Roy F. Weston, Inc. [Weston], 1990; Science Applications International Corporation [SAIC], 1993; Environmental Science and Engineering, Inc. [ESE], 1998). Not more than 40 milliliters of HD was typically reported to be used during each exercise (Weston, 1990). However, personnel interviewed during the environmental baseline survey (EBS) site visit stated that training aids were intentionally contaminated with up to 2 gallons of HD during each exercise (ESE, 1998). The training aids consisted of surplus vehicles that had been taken out of service and dedicated to these decontamination training exercises. After being intentionally contaminated with chemical warfare agent (CWA), the training aid was decontaminated using volumes of decontaminant (STB, DS2, or DANC) well in excess of the volume actually required to affect complete decontamination. One report indicated that both agents mustard and HD were used, and that most training occurred in the northern half of the area (ESE, 1998). Reportedly, personnel decontamination was also conducted here before trainees left the site; expended protective mask canisters were collected and sent to the on-site landfill; presumably to Landfill No. 3 (ESE, 1998).

Vehicles used as training aids are clearly visible at Training Area T-6 on aerial photographs (December 9, 1954, and March 10, 1973) (ESE, 1998). The training aids were located in the northern portion of the site and aligned northeast-southwest in 1954. The training aids were located in the same area in 1973, but were realigned to a northwest-southeast orientation (ESE, 1998).

CWM was not detected in surface soil samples collected and analyzed by the Army in 1973. The area was authorized by U.S. Army Toxic and Hazardous Material Agency and the U. S. Army Chemical School (USACMLS) for surface use only because subsurface soil sampling had not been conducted. The SI completed in 1993 included six soil samples collected from three locations at depths of between 1 foot and 5 feet (SAIC, 1993). Of these three locations, two were adjacent to the decontamination pads in the central-western portion of the site and one was near

the pad at the southern end of the site near the gate. The samples were screened for HD using the Miniature Continuous Air Monitoring System (MINICAMS) and nothing was detected above background readings. Laboratory analysis for agent degradation products was also negative (SAIC, 1993).

The historical aerial photograph analysis shows open areas and objects possibly used for decontamination training. Nearly all of the activity occurred on the northern half of this site. One cleared area at the end of a north/south trail near the center of the fenced area appears in the 1954 aerial photograph and is suspected of being a possible burial site (Parsons, 1999). However, a site visit by IT in August 2000 did not reveal any burial sites. Activity at the site ceased or diminished dramatically sometime after 1969, since the area becomes largely revegetated in the subsequent photograph taken in 1982 (Parsons, 1999). This timeframe coincides with the reported dates of use for the area, with activities stopping in 1973 when the Chemical School left FTMC (Parsons, 1999).

Blacktop Training Area, Parcel 511(7) and Fenced Yard in Blacktop Area, Parcel 512(7). The Blacktop Training Area, Parcel 511(7), will be addressed with the Fenced Yard in the Blacktop Area, Parcel 512, as identified in the archive search report (USACE, 1999a). The area is a little over 3 acres and is primarily an "asphalt parking lot" type area located south of 25th Street, along the east side of 12th Avenue, with viewing stands (bleachers) on both ends of the area, and an inner fenced-in portion (Figure 1-5) (Parsons, 1999). The fenced yard in the Blacktop Area is almost one-half acre in addition to the 3 acres in the Blacktop Area.

The Blacktop Training Area was identified on the 1956 map of the Chemical Corps Training Areas and the 1969 Chemical School Orientation Map (Parsons, 1999). Various demonstrations may have taken place here, such as decontamination training, but the exact use is unknown. The area was reportedly used for training in the use of flame throwers, decontamination equipment, and smoke generators. The Fenced Yard, enclosed by the high fence, was believed to have been used to store agent or for toxic agent training (Figure 1-5). However, it may be a more recent structure (Parsons, 1999).

The analysis of historical aerial photographs shows that the area was cleared in the early 1940s and paved sometime after the 1954 aerial photograph was taken (Parsons, 1999). Once the area was paved, very few changes occurred that are visible in the aerial photographs. The one change

that did occur is that the fenced area (Fenced Yard in Blacktop Area, Parcel 512) on the western edge of the pavement first shows up in the 1982 aerial photograph (Parsons, 1999). Anomaly features seen on the photographs located at the north and south ends of the paved area are bleachers, suggesting that training demonstrations took place here (Parsons, 1999).

Dog Training Area, Parcel 513(7) and Dog Kennel Area, Parcel 516(7). The Dog Training Area, Parcel 513(7), is located at the south end of 12th Street (Figure 1-6) and near the Dog Kennel Area, Parcel 516(7) (Figure 1-6) (Parsons, 1999). The area has been recently mowed and cleared, however, it is no longer in use (Parsons, 1999). The Dog Kennel Area has been separated from the Training Area T-5, Parcel 182(7), to be investigated with the Dog Training Area. Additionally, the Dog Kennel Area was given a separate parcel number (516[7]) (Figure 1-7). Both areas are approximately 1-acre sites.

The site was used for training dogs for the U.S. Army Military Police School and remnants of the training obstacles were still in existence in September 1998 (Parsons, 1999). A large, blistered/corroded concrete pad which was surrounded by a high fence is located within the area and may have been used to store agents or to conduct toxic agent training in "Transfer Operations," since the Depot Area is across the road from this area (USACE, 1999a).

The historical aerial photograph analysis revealed this area contained numerous buildings in the 1940s, and the concrete pad is one of many building foundations from that era. More recent aerial photos showed several cleared areas that were likely used for dog training, but no suspect CWM training areas (Parsons, 1999). A site walk conducted by Parsons in February 1999 showed the area cleared of former dog training aids except for the concrete pad located at the site. This pad is heavily blistered/corroded, unlike other foundation pads in the vicinity (Parsons, 1999).

Training Area T-5, Parcel 182(7). Training Area T-5, Parcel 182(7), is also known as the former Area T-5: Toxic Hazards Detection and Decontamination Training Area. It was located at the south end of 13th Avenue between Sunset and Howitzer Hills and covers approximately 10 and one-half acres (Figure 1-7). The Dog Kennel Area, Parcel 516(7) was separated from the Training Area T-5 to be investigated with the Dog Training Area, Parcel 513(7) (Figure 1-7). Training Area T-5 was reportedly used from 1961 to 1973. The site is posted and partially fenced (the fence is missing at the northern boundary). The operations conducted here reportedly

involved detection and decontamination of CWM, including HD, nerve agent O-ethyl-S-(diisoproplaminoethyl)-methylphosphonothiolate (VX), and GB. The decontaminant chemicals STB and DS2 were probably also used here.

Training Area T-5 is wooded with mixed pine and hardwoods, including loblolly pine, yellow poplar, sassafras, dogwood, blackgum, red maple, blackjack oak, chestnut oak, some sweetgum and hickory, and Virginia pine (SAIC, 1999). The stand of trees becomes younger to the south along the road at the western side of the site, where the hardwoods are mostly saplings. The area to the east of the lower road is level, with an older stand of mostly hardwoods with some pines. There are white oaks, pines to 16-inches diameter, sweetgum, hickory, and black cherry. There is a fairly open understory of dogwood, hardwood seedlings, and saplings. A small wet-weather stream runs along the eastern perimeter and off of the area. Flicker, Carolina chickadee, and nuthatch were observed on the site, as well as deer and deer trails, during the SAIC site reconnaissance on August 29 through 31, 1994 (SAIC, 1999).

Personnel interviewed during the EBS site visit report that explosive ordnance disposal (EOD) personnel formerly conducted “render-safe” exercises on munitions (typically artillery shells) in this area (ESE, 1998). EOD personnel placed the munition on the ground and poured a vial of a specific live CWA over the munition. The EOD reaction team then identified the CWA, decontaminated the munition, and packed it for transport. Exercises reportedly took place no more than 50 meters off the road. Some reports maintain that Training Area T-5 training used simulated CWM rounds only and that water was used as the decontaminant instead of STB or DS2 (ESE, 1998).

Previous reports speculated that this may be the site of a 110-gallon HD spill (Area T-4 or T-5) which reportedly occurred in 1955 (Weston, 1990). None of the personnel interviewed during the EBS site visit could recall a 110-gallon spill nor could they imagine a scenario during which a spill of this magnitude could occur; however, the HD simulant molasses residuum was delivered in 55-gallon drums. Site soils were reportedly chemically decontaminated, excavated, and disposed of at Range J (ESE, 1998).

In 1972 and 1973 the Army collected shallow soil samples from Training Area T-5 and analyzed them for HD, GB, and VX. There were not any CWAs detected in these samples and the area was permitted for surface use only (SAIC, 1993). Field screening and laboratory analysis of

additional soil, sediment, and surface water samples collected at high probability locations did not detect HD, GB, VX, or their degradation products (ESE, 1998).

Investigations conducted during the remedial investigaion (RI) included field screening for CWM and CWM breakdown products, and soil sampling, surface water, and sediment sampling (SAIC, 1995). Ordnance was observed in Training Area T-5 and appeared to be the result of recent U.S. Army training using dummy rounds (ESE, 1998).

Former Detection and Identification Area, Parcel 180(7). The Former Detection and Identification Area, Parcel 180(7), was located southwest of Building 3185 and covers an area of approximately one-half acre (Figure 1-8). This area was used from some time in the 1950s until 1972 for training in the detection and identification of CWM. The CWM used at this location may include simulants, HD, GB, carbonyl chloride, cyanogen chloride, dichloroformoxime, hydrogen cyanide, STB, and DS2 (ESE, 1998). Portions of this area are currently fenced and posted (Weston, 1990).

The site contains a young stand of mixed pine and hardwoods, (maximum of 6-inch diameter pine) with black cherry, sweetgum, and red cedar trees (SAIC, 1999). There is an understory with sumac, *Vitis spp.*, honeysuckle, and Virginia creeper (SAIC, 1999). There is a well-developed litter layer of mostly pine needles. Snow damage to many small pines in the area was evident (trees were bent, broken, or uprooted) from a snowstorm in the spring of 1993. Herbaceous cover included passionflower and an unidentified tall feathery asparagus-like plant. Some herbaceous cover (about 25 percent) in areas of the site was disturbed by sampling and drilling activities. The site is surrounded on three sides by more mature pine stands. The surrounding stand of trees has loblolly pines to about 18 inches diameter, with some dogwood and small privet. Carolina chickadees were observed on the site. There was evidence of striped skunks (SAIC, 1999). Numerous deer tracks were observed at the site.

Weston (1990) reported that several types of live CWM may have been used here and that STB and DS2 were used on surface soils, presumably during final decontamination before the USACMLS transferred from FTMC to the Aberdeen Proving Ground, Edgewood Area in 1973. Weston (1990) also reported that training aids and "a building from Area T-4 were burned twice and buried" at this site (Weston, 1990).

Personnel interviewed during the EBS site visit who participated directly in operations at this site report that no training materials (CWM) contacted the ground and that no disposal activities occurred at this location to the best of their knowledge (ESE, 1998). Accounts of personnel interviewed during the EBS site visit differ regarding the CWM used. Some sources indicate that only simulants were used at this location, while others recall that dilute CWM-containing mixtures were used to train troops. Vials of simulated CWM (dilute live CWM according to some sources), were reportedly placed into containers atop poles in the training area. The poles were approximately 3 feet tall, approximately twenty-four in number, and are visible on 1964 aerial photos. SCAITS kits (chemical identification kits) were used at the Former Detection and Identification Area. Vials in old SCAITS kits of the 1950s reportedly contained a very low concentration of CWM. There were not any spills reported at this site (ESE, 1998). In 1973, the surface was declared clean by U.S. Army Toxic and Hazardous Materials Agency and FTMC USACMLS and the area was authorized for surface use only (ESE, 1998).

FTMC personnel report that other training activities known as "G-shoots" were conducted at a VX demonstration area that was located in the northern portion of the fenced Former Detection and Identification Area (ESE, 1998). The CWA GB was used in this training. The operation involved placing one drop of GB on the nose of a goat, observing symptoms, then reviving the animal with an intramuscular atropine injection. Reportedly, there was very little chance of CWA release during this exercise due to the small quantities on hand and controlled usage.

The Former Detection and Identification Area was investigated by geophysical surveys, trenching, and soil sampling during the RI (SAIC, 1995). Numerous geophysical anomalies were detected, some of which may indicate buried metallic or nonmetallic material. Four test pits were excavated in 1993 and four soil borings were drilled and sampled in 1994. Materials excavated from the test pits included construction debris (concrete and rebar). One soil sample was collected from each of the test pits. Samples were screened in the field for the presence of HD and GB, and then sent to the laboratory for determination of the presence of HD and GB breakdown products. Neither HD, GB, nor their breakdown products were detected in any of the soil samples or in samples collected from this area previously (SAIC, 1993; SAIC, 1995).

Old Burn Pit, Parcel 514(7). The Old Burn Pit, Parcel 514(7) is located in the woods behind the Motor Pool 3100 on 13th Avenue and covers an area of 0.15 acres (Figure 1-9). This site was identified for consideration during the field visit to collect information for the archive search

report (USACE, 1999a). Although nothing is known about the site and this area is not specifically listed as hosting chemical training, it appeared to be a burn pit and therefore was selected for further sampling to ensure that CWM was not present.

The aerial photograph analysis does show a well defined cleared area in the 1961 aerial photograph that coincides with the location of the burn pit (Parsons, 1999). A site visit conducted in February 1999 by Parsons revealed the area behind the Motor Pool to be wooded, but the remains of the pit were still visible. The pit is covered over with a wire mesh and contains some remnant metallic objects within it (Parsons, 1999).

Chemical, Biological, and Radiological Proficiency Area, Parcel 517(7). The Chemical, Biological, and Radiological Proficiency Area comprises just over 4 and one-half acres within the Main Post at FTMC (Oak Ridge National Laboratory, 1999). This area appears on the 1969 Orientation Map of the Chemical School Student Guide (USACE, 1999a). The site is located at the northwest corner of 23rd Street and 11th Avenue (Figure 1-10). It is not known how the site was used by the Chemical School. The use of toxic agents at this site is also unknown. Buildings 3136 (adjacent to the parcel) and 3137 have since been erected at this site (1976 and 1988, respectively).

Old Toxic Training Area, Parcel 188(7). The Old Toxic Training Area, Parcel 188(7**)** is on the Main Post, located across the road south and east of Building 3183 (Figure 1-11). The site reportedly occupied an area of up to 10,000 square feet. The parcel size that is shown in the EBS is almost 1 acre (ESE, 1998). The Old Toxic Training Area is reported to be located in a ditch or shallow depression behind Building 3183 (on the south side), east of 13th Avenue. Parsons reported the total area to be about 484 square feet (Parsons, 1999). The site was reportedly used from the 1950s through at least the 1960s; although exact dates of operation could not be determined. The current status of the site includes unrestricted access, fenced/posted, and paved areas.

The site was reportedly formerly used for training military personnel in the detection and identification of HD and possibly other CWM and the use of decontamination agents, probably including STB, DANC, and/or DS2. Some personnel report training here using dilute HD, choking agents, blood agents (ESE, 1998), and nerve agent (VX). Training reportedly used minute quantities of CWM (ESE, 1998).

SAIC (1993) reported that the site consisted of a ditch with an area of about 480 square feet used in training for detection of HD (ESE, 1998). No spills were reported; and decontamination was reportedly conducted after each exercise. Some personnel interviewed during the EBS site visit recalled live CWM training in a ditch in this area; others do not. One individual interviewed during the EBS site visit believed that the Old Toxic Training Area was actually located east of Building 3183, not to the south as reported by others (ESE, 1998). Other personnel report no knowledge of training activities at this location and reportedly walked across this location regularly during the 1960s and 1970s (ESE, 1998).

Previous investigations report that CWM appear to have been placed on the ground surface and likely decontaminated with STB and DS2 (Weston, 1990). Training exercises conducted at this area were reportedly similar to those at the Former Detection and Identification Area, and this area was used only when the Former Detection and Identification Area was not available.

A SI completed in 1993 included four soil samples collected from two locations at depths of between 1 foot and 5 feet (SAIC, 1993). The two sampling locations were along the centerline of the ditch. The samples were screened for HD by U.S. Army Technical Escort Unit (USATEU) using the MINICAMS and nothing was detected above background readings. Laboratory analysis for degradation products was also negative (SAIC, 1993).

Historical aerial photograph analysis does not show any significant indications of CWM activity at this site over the years (Parsons, 1999). A bare area that could be a ditch is visible east of the building in the 1954 aerial photograph. There are not any other anomalies that appear to be ditches on the east side of the building (Parsons, 1999).

A site visit in February 1999 by Parsons determined that the area east of Building 3183 is paved as a parking lot/driveway. Historical reports indicate that live agent was not placed on the ground from 1961 to 1964. It appears most likely, that if live agent was put on the ground, it was prior to 1961 (Parsons, 1999).

Soils. Soils at the CWM sites fall primarily in the followings soil series:

- Anniston and Allen series
- Montevallo series
- Jefferson series.

The soils at five of the CWM sites fall into Anniston and Allen gravelly loams, 2 to 6 percent slopes, eroded (AcB2) (U.S. Department of Agriculture [USDA], 1961). These sites are the following:

- Dog Training Area (Parcel 513)
- Dog Kennel Area (Parcel 516)
- Training Area T-5 (Parcel 182)
- Former Detection and Identification Area (Parcel 180)
- Old Toxic Training Area (Parcel 188).

The Anniston and Allen series of soils consist of strongly acid, deep, well-drained soils that have developed in old local aluvium. The parent material washed from the adjacent higher lying Linker, Muskingum, Enders, and Montevallo soils, which developed from weathered sandstone, shale, and quartzite. The surface sandstone and quartzite gravel and cobbles, as much as 8 inches in diameter, are on the surface and throughout the soil. The depth to bedrock at these sites ranges from 2 feet to greater than 10 feet. The depth to the water table is likely greater than 20 feet. The typical soil description is 2 to 10 feet of well-drained stony loam to clay loam over stratified local alluvium, limestone or shale bedrock. Shallow groundwater direction at the site is probably controlled by topography.

This mapping unit (AtB2) consists of friable soils that have developed in old alluvium on foot slopes and along the base of mountains. The color of the surface soil ranges from very dark brown and dark brown to reddish brown and dark reddish brown. The texture of subsoil ranges from light clay loam to clay or silty clay loam. The alluvium ranges in thickness from 2 to more than 8 feet. Infiltration and runoff are medium, permeability is moderate, and the capacity for available moisture is high. Organic matter is moderately low.

Soils at the Agent ID Area (Parcel 509) fall into the Anniston and Allen gravelly loams, 6 to 10 percent slopes, eroded (AcC2) (USDA, 1961). The general Anniston and Allen series is described above.

This mapping unit (AcC2) consists of friable soils that have developed in old alluvium on foot slopes and along the base of mountains. The color of the surface soil ranges from very dark brown and dark brown to reddish brown and dark reddish brown. The texture of subsoil ranges from light clay loam to clay or silty clay loam. The alluvium ranges in thickness from 2 to more

than 8 feet. Infiltration and runoff are medium, permeability is moderate, and the capacity for available moisture is high. Organic matter is moderately low. Some severely eroded areas may be common on the surface for the AcC2 soil type, as well as a few shallow gullies.

Soils at the CBR Proficiency Area (Parcel 517) fall into the Anniston and Allen gravelly loams, 10 to 15 percent slopes, eroded (AcD2) (USDA, 1961). The general Anniston and Allen series is described above.

This mapping unit (AcD2) consists of friable soils that have developed in old alluvium on foot slopes and along the base of mountains. The color of the surface soil ranges from very dark brown and dark brown to reddish brown and dark reddish brown. The texture of subsoil ranges from light clay loam to clay or silty clay loam. The alluvium ranges in thickness from 2 to more than 8 feet. Infiltration and runoff are medium, permeability is moderate, and the capacity for available moisture is high. Organic matter is moderately low.

Soils at the Old Burn Pit (Parcel 514) fall into the Anniston and Allen gravelly loams, 15 to 25 percent slopes, eroded (AcE2) (USDA, 1961). The general Anniston and Allen series is described above.

This mapping unit (AcE2) consists of surface soil that is very dark brown to very dark grayish–brown gravelly loam, 6 to 8 inches thick. In many places, severely eroded patches and shallow gullies are common. The plow layer is reddish-brown to dark reddish-brown gravelly clay loam.

Soils at Training Area T-6 (Naylor Field) (Parcel 183) fall into the mapping unit of Montevallo shaly silty clay loam, 10 to 40 percent slopes, severely eroded (MtD3) (USDA, 1961). The Montevallo series consists of shallow, well-drained strongly acid soils that have developed in the residuum of interbedded shale and fine-grained sandstone or limestone. Where these soils are not eroded, the surface soil is very dark grayish-brown to very dark brown shaly silt loam. Fragments of shale, less than two inches in size, are commonly in the soil. The depth to bedrock typically ranges from 1 feet to 1.5 feet below ground surface (bgs). The depth to the water table for this series is usually greater than 20 feet.

This mapping unit (MtD3) consists of soils that have developed in residuum on upland. Erosion has removed all or nearly all of the original surface soil. The color of the soil 2 to 4 inch surface

bgs is a yellowish-brown shaly silty clay loam. The sub-soil is a yellowish-brown shaly silt loam. Fragments of shale, less than two inches square, are commonly in the soil.

Soils at the Blacktop Training Area and Fenced Yard in the Blacktop Area (Parcels 511 and 512, respectively) fall into the Jefferson gravelly fine sandy loam, 2 to 6 percent slopes, eroded (JeB2) (USDA, 1961). The soils at this site are of the Jefferson series and typically consist of 1.5 feet to 4 feet of well-drained, strongly acid soils that occur in small areas on fans and on foot slopes in the Choccolocco, Colvin and Coldwater Mountains (USDA, 1961). These soils have developed from old local alluviums that washed or sloughed from ridges of sandstone, shale, and Weisner quartzite. Shallow groundwater direction at the site is probably controlled by topography and is probably to the southeast. The depth to bedrock typically ranges from 2 feet to greater than 4 feet. The depth to the water table for this series is usually greater than 20 feet.

This mapping unit (JeB2) is friable soil developed from old local alluvium on foot slopes and fans along ridges and mountains. The surface soil is dark-grayish-brown fine sandy loam, and the subsoil is yellowish-brown, light fine sandy clay. Fragments as large as 8 inches in diameter are on the surface and throughout the soil.

1.4 Regional Geology

Calhoun County includes parts of two physiographic provinces, the Piedmont Upland Province and the Valley and Ridge Province. The Piedmont Upland Province occupies the extreme eastern and southeastern portions of the county and is characterized by metamorphosed sedimentary rocks. The generally accepted range in age of these metamorphics is Cambrian to Devonian.

The majority of Calhoun County, including the Main Post of FTMC, lies within the Appalachian fold and thrust structural belt (Valley and Ridge Province) where southeastward-dipping thrust faults with associated minor folding are the predominant structural features. The fold and thrust belt consists of Paleozoic sedimentary rocks that have been asymmetrically folded and thrust-faulted with major structures and faults striking in a northeast-southwest direction.

Northwestward transport of the Paleozoic rock sequence along the thrust faults has resulted in the imbricate stacking of large slabs of rock referred to as thrust sheets. Within an individual thrust sheet, smaller faults may splay off the larger thrust fault, resulting in imbricate stacking of rock units within an individual thrust sheet (Osborne and Szabo, 1984). Geologic contacts in this region generally strike parallel to the faults and repetition of lithologic units is common in

vertical sequences. Geologic formations within the Valley and Ridge Province portion of Calhoun County have been mapped by Warman and Causey (1962), Osborne and Szabo (1984), and Moser and DeJarnette (1992), and vary in age from Lower Cambrian to Pennsylvanian.

The basal unit of the sedimentary sequence in Calhoun County is the Cambrian Chilhowee Group. The Chilhowee Group is comprised of the Cochran, Nichols, Wilson Ridge, and Weisner Formations (Osborne and Szabo, 1984), but in Calhoun County is either undifferentiated or divided into the Cochran and Nichols Formations and an upper undifferentiated Wilson Ridge and Weisner Formation. The Cochran is composed of poorly sorted arkosic sandstone and conglomerate with interbeds of greenish-gray siltstone and mudstone. Massive to laminated, greenish-gray and black mudstone makes up the Nichols Formation with thin interbeds of siltstone and very fine-grained sandstone (Szabo et al., 1988). These two formations are mapped only in the eastern part of the county.

The Wilson Ridge and Weisner Formations are undifferentiated in Calhoun County and consist of both coarse-grained and fine-grained clastics. The coarse-grained facies appear to dominate the unit and consist primarily of coarse-grained, vitreous quartzite, and friable, fine- to coarse-grained, orthoquartzitic sandstone, both of which locally contain conglomerate. The fine-grained facies consist of sandy and micaceous shale and silty, micaceous mudstone, which are locally interbedded with the coarse clastic rocks. The abundance of orthoquartzitic sandstone and quartzite suggests that most of the Chilhowee Group bedrock in the vicinity of FTMC belongs to the Weisner Formation (Osborne and Szabo, 1984).

The Cambrian Shady Dolomite overlies the Weisner Formation east and southwest of the Main Post and consists of interlayered bluish-gray or pale yellowish-gray sandy dolomitic limestone and siliceous dolomite with coarsely crystalline porous chert (Osborne et al., 1989). A variegated shale and clayey silt have been included within the lower part of the Shady Dolomite (Cloud, 1966). Material similar to this lower shale unit was noted in core holes drilled by the Alabama Geologic Survey on FTMC (Osborne and Szabo, 1984). The character of the Shady Dolomite in the FTMC vicinity and the true assignment of the shale at this stratigraphic interval are still uncertain (Osborne, 1999).

The Rome Formation overlies the Shady Dolomite and locally occurs to the northwest and southeast of the Main Post as mapped by Warman and Causey (1962) and Osborne and Szabo

(1984), and immediately to the west of Reilly Airfield (Osborne and Szabo, 1984). The Rome Formation consists of variegated thinly interbedded grayish-red-purple mudstone, shale, siltstone, and greenish-red and light gray sandstone, with locally occurring limestone and dolomite. The Conasauga Formation overlies the Rome Formation and occurs along anticlinal axes in the northeastern portion of Pelham Range (Warman and Causey, 1962; Osborne and Szabo, 1984) and the northern portion of the Main Post (Osborne et al., 1997). The Conasauga Formation is composed of dark-gray, finely to coarsely crystalline medium- to thick-bedded dolomite with minor shale and chert (Osborne et al., 1989).

Overlying the Conasauga Formation is the Knox Group, which is composed of the Copper Ridge and Chepultepec dolomites of Cambro-Ordovician age. The Knox Group is undifferentiated in Calhoun County and consists of light medium gray, fine to medium crystalline, variably bedded to laminated, siliceous dolomite and dolomitic limestone that weathers to a chert residuum (Osborne and Szabo, 1984). The Knox Group underlies a large portion of the Pelham Range area.

The Ordovician Newala and Little Oak Limestones overlie the Knox Group. The Newala Limestone consists of light to dark gray, micritic, thick-bedded limestone with minor dolomite. The Little Oak Limestone is comprised of dark gray, medium- to thick-bedded, fossiliferous, argillaceous to silty limestone with chert nodules. These limestone units are mapped together as undifferentiated at FTMC and other parts of Calhoun County. The Athens Shale overlies the Ordovician limestone units. The Athens Shale consists of dark-gray to black shale and graptolitic shale with localized interbedded dark gray limestone (Osborne et al., 1989). These units occur within an eroded “window” in the uppermost structural thrust sheet at FTMC and underlie much of the developed area of the Main Post.

Other Ordovician-aged bedrock units mapped in Calhoun County include the Greensport Formation, Colvin Mountain Sandstone, and Sequatchie Formation. These units consist of various siltstones, sandstones, shales, dolomites, and limestones, and are mapped as one undifferentiated unit in some areas of Calhoun County. The only Silurian-age sedimentary formation mapped in Calhoun County is the Red Mountain Formation. This unit consists of interbedded red sandstone, siltstone, and shale with greenish-gray to red silty and sandy limestone.

The Devonian Frog Mountain Sandstone consists of sandstone and quartzitic sandstone with shale interbeds, dolomudstone, and glauconitic limestone (Szabo et al., 1988). This unit locally occurs in the western portion of Pelham Range.

The Mississippian Fort Payne Chert and the Maury Formation overlie the Frog Mountain Sandstone and are composed of dark- to light-gray limestone with abundant chert nodules and greenish-gray to grayish-red phosphatic shale with increasing amounts of calcareous chert toward the upper portion of the formation (Osborne and Szabo, 1984). These units occur in the northwestern portion of Pelham Range. Overlying the Fort Payne Chert is the Floyd Shale, also of Mississippian Age, which consists of thin-bedded, fissile brown to black shale with thin intercalated limestone layers and interbedded sandstone. Osborne and Szabo (1984) reassigned the Floyd Shale, which was mapped by Warman and Causey (1962) on the Main Post of FTMC, to the Ordovician Athens Shale on the basis of fossil data.

The Jacksonville Thrust Fault is the most significant structural geologic feature in the vicinity of FTMC, both for its role in determining the stratigraphic relationships in the area and for its contribution to regional water supplies. The trace of the fault extends northeastward for approximately 39 miles between Bynum, Alabama and Piedmont, Alabama. The fault is interpreted as a major splay of the Pell City Fault (Osborne and Szabo, 1984). The Ordovician sequence comprising the Eden thrust sheet is exposed at FTMC through an eroded "window" or "fenster" in the overlying thrust sheet. Bedrock units within the window display complex folding. The folds are overturned and tight to isoclinal. The carbonates and shales locally exhibit well-developed cleavage (Osborne and Szabo, 1984). The FTMC window is framed on the northwest by the Rome Formation, north by the Conasauga Formation, northeast, east and southeast by the Shady Dolomite, and southwest by the Chilhowee Group (Osborne et al., 1997).

1.5 Local Geology

The 11 CWM sites are located on the southern boundary of the FTMC Geologic Window. Figure 1-12 is a geological map of the area of the 11 CWM sites. The bedrock within the window consists of the undifferentiated Ordovician Newala and Little Oak Limestones and the undifferentiated Ordovician/Mississippian Athens and Floyd Shales (Osborne et al., 1997). The boundary of the window is defined by the Jacksonville Fault, which extends in an irregular line from west to east through the area. Regionally, the Jacksonville Fault strikes northeast to southwest. The fault strikes northwest to southeast through the central portion of Parcel 182(7)

and roughly west to east through the central portion of Parcel 183(6). The bedrock unit to the south of the Jacksonville Fault, in the area of the CWM sites, is mapped as Cambrian undifferentiated Chilhowee Group (Osborne et al., 1997).

Agent ID Area (Parcel 509[7]), Blacktop Training Area (Parcel 511[7]), Fenced Yard in Blacktop Area (Parcel 512[7]), Dog Training Area (Parcel 513[7]), Dog Kennel Area (Parcel 516[7]), Old Burn Pit (Parcel 514[7]), and Former Detection and Identification Area (Parcel 180[7]). Bedrock in the area of Parcels 509(7), 511(7), 512(7), 513(7), 516(7), 514(7), and 180(7) has been mapped as the undifferentiated Ordovician/Mississippian Athens and Floyd Shales. Data collected during SI activities from parcels in the vicinity of these CWM sites indicate that the shale is gray to black and severely to slightly weathered. Split-spoon samples collected from the severely weathered shale are characterized as very friable, brittle, and thin bedded with a steep to near vertical dip. Hollow-stem auger drilling is generally easy through the severely to moderately weathered shale and hard in the lightly weathered and fractured shale.

Old Toxic Training Area (Parcel 188[7]) and CBR Proficiency Area (Parcel 517[7]). The undifferentiated Ordovician/Mississippian Athens and Floyd Shales and undifferentiated Ordovician Newala and Little Oak Limestones underlie Parcels 188(7) and 517(7). The shale units underlie the southern two-thirds of Parcel 188(7) and all but the northwest corner of Parcel 517(7). Data collected during previous SI activities at other parcels in the vicinity of these CWM sites indicate that the shale is gray to black and severely to slightly weathered.

The limestone units are mapped by the Geologic Survey of Alabama (GSA) as extending across the northern end of Parcel 188(7) and the northwestern corner of Parcel 517(7). Sandy and gravelly clay soils with chert (typical of limestone derived soils) were encountered at nearby parcels. Shallow auger refusal on chert and limestone has occurred nearby.

Training Area T-5 (Parcel 182[7]) and Training Area T-6 (Parcel 183[6]). The Jacksonville Fault extends through Parcels 182(7) and 183(6). The bedrock below the eastern half of Parcel 182(7) and all but the southwestern corner of Parcel 183(6) consists of the Athens and Floyd Shale. Data collected during SI activities from parcels in the vicinity of these 11 CWM sites indicate that the shale is gray to black and severely to slightly weathered.

The undifferentiated Chilhowee Group underlies the western half of Parcel 182(7) and the southwestern corner of Parcel 183(6). Data collected during SI activities from parcels underlain by the Chilhowee Group indicate the unit is characterized as white, fine to medium grained sand, sandstone and quartzite. Osborne and Szabo classified this unit as the Weisner Formation of the Chilhowee Group (Osborne and Szabo, 1984).

1.6 Regional Hydrogeology

The hydrogeology of Calhoun County has been investigated by the GSA (Moser and DeJarnette, 1992) and the U.S. Geological Survey in cooperation with the GSA (Warman and Causey, 1962) and Alabama Department of Environmental Management (ADEM) (Planert and Pritchett, 1989). Groundwater in the vicinity of FTMC occurs in residuum derived from bedrock decomposition; within fractured bedrock; along fault zones; and from the development of karst frameworks. Groundwater flow may be estimated to be toward major surface water features. However, because of the impacts of differential weathering, variable fracturing, and the potential for conduit flow development, the use of surface topography as an indicator for groundwater flow direction must be used with caution in the area. Areas with well-developed residuum horizons may subtly reflect the surface topography, but the groundwater flow direction also may exhibit the influence of pre-existing structural fabrics or the presence of perched water horizons on unweathered ledges or impermeable clay lenses.

Precipitation and subsequent infiltration provide recharge to the groundwater flow system in the region. The main recharge areas for the aquifers in Calhoun County are located in the valleys. The ridges generally consist of sandstones, quartzite, and slate which are resistant to weathering, relatively unaffected by faulting, and therefore, relatively impermeable. The ridges have steep slopes and thin to no soil cover, which enhances runoff to the edges of the valleys (Planert and Pritchett, 1989).

The thrust fault zones typical of the county form large storage reservoirs for groundwater. Points of discharge occur as springs, effluent streams, and lakes. Coldwater Spring is the largest spring in the state of Alabama with a discharge of approximately 32 million gallons per day. This spring is the main source of water for the Anniston Water Department from which FTMC buys its water. The spring is located approximately 5 miles southwest of Anniston and discharges from the brecciated zone of the Jacksonville Fault (Warman and Causey, 1962).

Shallow groundwater on FTMC occurs principally in the residuum developed from Cambrian sedimentary and carbonate bedrock units of the Weisner Formation, Shady Dolomite and locally in lower Ordovician carbonates and shales. The shallow groundwater in this area generally flows to the northwest and discharges to streams in the area. The residuum may yield adequate groundwater for domestic and livestock needs but may go dry during prolonged dry weather. Groundwater within the residuum serves as a recharge reservoir for the underlying bedrock aquifers. Bedrock permeability is locally enhanced by fracture zones associated with thrust faults and by the development of solution (karst) features.

Two major aquifers were identified by Planert and Pritchett (1989), the Knox-Shady and Tuscumbia-Fort Payne Aquifers. The continuity of the aquifers has been disrupted by the complex geologic structure of the region, such that each major aquifer occurs repeatedly in different areas. The Knox-Shady Aquifer group occurs over most of Calhoun County and is the main source of groundwater in the county. It consists of the Cambrian and Ordovician aged quartzite and carbonates. The Conasauga Dolomite is the most utilized unit of the Knox-Shady Aquifer, with twice as many wells drilled as any other unit (Moser and DeJarnette, 1992).

The Tuscumbia-Fort Payne Aquifer occurs in the extreme northwestern portion of the county. This aquifer consists of Mississippian age carbonates and shales. Because of its limited outcrops in the recharge area, and the rugged terrain of the outcrop area, the Tuscumbia-Fort Payne Aquifer is not considered a major groundwater supply in Calhoun County (Moser and DeJarnette, 1992). However, it is an important source of groundwater in counties to the west (Planert and Pritchett, 1989).

1.7 Local Hydrogeology

Groundwater in the vicinity of the 11 CWM sites generally occurs within the residuum and the weathered zone of the undifferentiated Ordovician/Mississippian Athens and Floyd Shales. Based on data from temporary monitoring and permanent wells installed during previous SI activities at surrounding parcels, the depth to groundwater ranged from 8 to 32 feet bgs. The static water levels in these wells ranged from 0 to 22 feet above the depth at which groundwater was encountered.

The potentiometric surface shown in Figure 1-13 mimics the slope of the ground surface. Based on groundwater elevation data collected on April 22, 1999 from wells installed on surrounding

parcels during the SI activities, groundwater flow in the vicinity of the CWM sites locally appears to be the northeast, with the exception of Parcel 509(7), Parcel 188(7), and Parcel 511(7). Groundwater flow at Parcels 188(7) and 509(7) appears to be to the northwest. Groundwater flow at Parcel 511(7) appears to be to the north with components of northeasterly flow off Sunset Hill on the western side of the site and northwesterly flow from Howitzer Hill on the eastern side of the site.

1.8 Scope of Work

The scope of work for activities associated with the SI at the CWM sites, Parcels 509(7), 183(6), 511(7), 512(7), 513(7), 516(7), 182(7), 180(7), 514(7), 517(7), and 188(7), as specified by the statement of work (USACE, 1999b), includes the following tasks:

- Develop the SFSP attachment.
- Develop the SSHP attachment.
- Develop the site-specific UXO safety plan.
- Conduct a surface and near-surface UXO surveys over all areas to be included in the supplemental sampling effort.
- Provide downhole UXO survey support for all intrusive drilling to determine buried downhole hazards.
- Collect 43 surface soil samples, 43 subsurface soil samples, 41 groundwater samples, 17 surface water samples, and 17 sediment samples to determine the nature and extent of contamination present at the CWM sites, Parcels 509(7), 183(6), 511(7), 512(7), 513(7), 516(7), 182(7), 180(7), 514(7), 517(7), and 188(7) to provide data useful for supporting any future planned corrective measures and closure activities.
- Samples will be analyzed for the parameters listed in Section 4.6.
- Install additional monitoring wells and collect additional samples at potential sources of contamination identified during CWM engineering evaluation/cost analysis field programs.

Prior to IT conducting any field work at these sites, the USACE-Huntsville will clear the sites for CWM. Therefore, data related to CWM will not be collected as part of this SI. A CWM

investigation will be provided in the CWM sites engineering evaluation/cost analysis that is being proposed by USACE-Huntsville (Parsons, 1999).

A USACE-Huntsville requirement for conducting work at the CWM sites at FTMC is to use UXO anomaly avoidance techniques; therefore, UXO surface sweeps and downhole surveys of soil borings will be required to support field activities at the CWM sites. The surface sweeps and downhole surveys will be conducted to identify anomalies for the purposes of UXO avoidance.

At completion of the field activities and sample analyses, draft and final SI summary reports will be prepared to evaluate the absence or presence of potential site-specific chemicals (PSSC) at this site, and to determine the nature and extent of any contamination detected in site samples, and to recommend further actions, if appropriate. SI sampling reports will be prepared in accordance with current U.S. Environmental Protection Agency (EPA) Region IV and ADEM guidelines.

2.0 Summary of Existing Environmental Studies

An EBS was conducted by ESE to document current environmental conditions of all FTMC property (ESE, 1998). The study was to identify sites that, based on available information, have no history of contamination and comply with U.S. Department of Defense (DOD) guidance for fast-track cleanup at closing installations. The EBS also provides a baseline picture of FTMC properties by identifying and categorizing the properties by seven criteria.

1. Areas where no storage, release, or disposal (including migration) has occurred
2. Areas where only release or disposal of petroleum products has occurred
3. Areas of contamination below action levels
4. Areas where all necessary remedial actions have been taken
5. Areas of known contamination with removal and/or remedial action underway
6. Areas of known contamination where required response actions have not been taken
7. Areas that are not evaluated or require further evaluation.

The EBS was conducted in accordance with the Community Environmental Response Facilitation Act (CERFA) (CERFA-Public Law 102-426) protocols and DOD policy regarding contamination assessment. Record searches and reviews were performed on all reasonably available documents from FTMC, ADEM, EPA Region IV, and Calhoun County, as well as a database search of Comprehensive Environmental Response, Compensation, and Liability Act-regulated substances, petroleum products, and Resource Conservation and Recovery Act-regulated facilities. Available historic maps and aerial photographs were reviewed to document historic land uses. Personal and telephone interviews of past and present FTMC employees and military personnel were conducted. In addition, visual site inspections were conducted to verify conditions of specific property parcels.

The CWM sites being investigated as part of this SI were identified as Category 6 and Category 7 CERFA sites. These CERFA sites are parcels where site-specific chemicals were stored, and possibly released onto the site or to the environment, and/or were disposed of on site property. Catergory 6 CERFA sites are areas of known contamination where required response actions

have not been taken. Category 7 CERFA sites are areas that lack adequate documentation and, therefore, requires additional evaluation to determine the environmental condition of the parcels.

Investigations and additional site studies were conducted at four of the CWM sites being investigated as part of this SI. The following are the sites where additional investigations were conducted:

- Training Area T-6 (Naylor Field) (Parcel 183[6])
- Training Area T-5 (Parcel 182[7])
- Former Detection and Identification Area (Parcel 180[7])
- Old Toxic Training Area (Parcel 188[7]).

Training Area T-6 (Naylor Field) (Parcel 183[6]). Training Area T-6 (Naylor Field) (Parcel 183[6]), is an approximately 10-acre site formerly used for chemical agent (HD) decontamination training (SAIC, 1993). The site area is heavily wooded with small concrete structures and a network of drainage trenches at various locations on the site. Six shallow soil samples were collected by the USATEU in 1992 from three locations (Figure 2-1).

The soil samples were screened by MINICAMS on site for the presence of HD. The results of the field screening are provided in Table 2-1 and indicate that HD was not detected at the sampled locations. Appendix A presents the MINICAMS procedure and the definition of the time-weighted average (TWA) concentration.

Laboratory analyses for HD and HD breakdown products did not detect the presence of these compounds in the screened soil samples (SAIC, 1993). The results of the laboratory analyses for Training Area T-6 are provided in Table 2-2 and sample locations are shown on Figure 2-1. The site was decontaminated when closed (approximately 1973) and was subsequently cleared for surface usage (SAIC, 1993).

Training Area T-5 (Parcel 182[7]). Training Area T-5 consists of a wooded, approximately 10.5-acre site that included kennels for canine units (SAIC, 1993). The Dog Kennel Area has been separated from Training Area T-5 and has been assigned a separate parcel number (516[7]). Training Area T-5 was formerly used for chemical agent training between 1961 and 1973 using HD, GB, and VX (SAIC, 1993). The training sites were reportedly decontaminated after each exercise using STB and DS-2.

Table 2-1

USATEU Results for MINICAMS Screening Training Area T-6 Parcel 183(6) [a] Fort McClellan, Calhoun County, Alabama

Sample Number	Sample Depth (inches)	HD[b] (TWA)
T6-S0101	8 - 11	0.0
T6-S0102	60 - 66	0.0
T6-S0201	8 - 11	0.0
T6-S0202	58 - 64	0.0
T6-S0301	10 - 12	0.0
T6-S0302	60 - 64	0.0

[a] Science Applications International Corporation, 1993***, Fort McClellan Site Investigation Report***, August.

[b] Reported values are below the 0.8 time weighted average (TWA) for the MINICAMS and are not indicative of detected chemical warfare agent (USATEU, 6/92). See Appendix A for TWA definition.

TWA - Time-weighted average.
HD - Distilled mustard.

Table 2-2

SI Soil Sample Results[a]
Training Area T-6, Parcel 183(6)
Fort McClellan, Calhoun County, Alabama

SAIC ID Number:				T6-S01	T6-S01	T6-S02	T6-S02	T6-S03	T6-S03
Depth bgs (ft):[b]				(1.0)	(5.0)	(1.0)	(5.0)	(1.0)	(5.0)
Collection Date:				04/29/1992	04/29/1992	04/29/1992	04/29/1992	04/24/1992	04/24/1992
Associated Field QC Sample:				FAS001 FMP002	FAS001 FMP002	FAS001 FMP002	FAS001 FMP002	FAS001 FMP002	FAS001 FMP002
Parameter	Units	CRL	UCR	RB-007	RB-007	RB-007	RB-007	RB-005	RB-005
Method LL03 (Organosulfur Compounds in Soil)									
1,4-Oxathiane	µg/g	0.856	17.1	0.856 LT	0.856 LT	0.856 LT	0.856 LT	0.856 LT	0.856 LT
1,4-Dithiane	µg/g	1.47	11.3	1.47 LT	1.47 LT	1.47 LT	1.47 LT	1.47 LT	1.47 LT
p-Chlorophenylmethylsulfoxide	µg/g	2.25	45.0	2.25 LT	2.25 LT	2.25 LT	2.25 LT	2.25 LT	2.25 LT
p-Chlorophenylmethylsulfone	µg/g	2.37	47.4	2.37 LT	2.37 LT	2.37 LT	2.37 LT	2.37 LT	2.37 LT
Method LW18 (Thiodiglycol and Chloroacetic Acid in Soil)									
Thiodiglycol	µg/g	3.94	102.0	3.94 LT	3.94 LT	3.94 LT	3.94 LT	3.94 LT	3.94 LT

[a]Science Applications International Corporation, 1993, *Fort McClellan Site Investigation Report, August.*
[b]Although the samples appear to be the same as listed in Table 2-1, the sample depths do not match in the SAIC SI report.

bgs - Below ground surface.
CRL - Certified reporting limit.
LT - Less than the certified reporting limit.
µg/g - Micrograms per gram.
UCR - Upper certified range.
ft - Foot.
QC - Quality control.
SI - Site investigation.

Eight soil samples were collected by the USATEU from four locations at Training Area T-5 (Figure 2-2) (SAIC, 1993). The samples were screened in the field by USATEU personnel for chemical agent using a MINICAMS analyzer and were analyzed in the laboratory for the presence of chemical agent breakdown products. The results of the field screening for HD, GB, and VX are provided in Table 2-3 and range between 0.0 and 0.36 TWA (below the 0.8 TWA threshold for detection of HD, GB, and VX). Background readings at the site ranged between 0.12 and 0.36 TWA (below the 0.8 TWA threshold for detection of HD, GB, and VX). Field screening at high-probability locations for chemical agents at Training Area T-5 was negative. Laboratory analyses for HD, GB, and VX breakdown products in eight soil samples collected from the screened locations did not detect the presence of the degradation compounds in the samples (SAIC, 1993). The laboratory soil analyses results are provided in Table 2-4.

A surface water sample and sediment sample were collected from a tributary to the South Branch of Cane Creek where it traverses the eastern portion of Training Area T-5 (Figure 2-2). The samples were collected by USATEU personnel from the preselected downstream location and were submitted for laboratory analysis of chemical agent breakdown products. The laboratory analyses did not detect the presence of degradation compounds in the samples (Tables 2-5 and 2-6).

Evidence of ordnance was observed on the site in March 1992, near the surface water/sediment sampling point (SAIC, 1993). Subsurface sampling and analysis at high-probability locations for the presence of CWAs and their degradation products did not detect the presence of these compounds at Training Area T-5 (SAIC, 1993).

A RI was conducted at Training Area T-5. The objectives of the study were to investigate the presence, nature, and extent of potential environmental contamination resulting from previous controlled U.S. Army CWA training activities and uncontrolled munitions and municipal waste disposal (SAIC, 1995).

Training Area T-5 was investigated using MINICAMS screening of near surface soils for CWA, shallow soil sampling, and surface water/sediment sampling (Figure 2-3). Historical documentation for the site, including training location sketches, ground-level photography, and historical soil sampling, were used to identify screening and sampling locations across the site

Table 2-3

USATEU Results of MINICAMS Screening Training Area T-5 Parcel 182(7) [a] Fort McClellan, Calhoun County, Alabama

Sample Number	Sample Depth (inches)	HD (TWA)[b]	GB (TWA)[b]	VX (TWA)[b]
T5-S0401	12 – 15	0.05	0.01	0.15
T5-S0402	74 – 76	0.00	0.00	0.23
T5-S0301	9 – 12	0.04	0.00	0.00
T5-S0302	60 – 63	0.04	0.00	0.19
T5-S0201	9 – 12	0.04	0.01	0.12
T5-S0202	57 –60	0.03	0.00	0.15
T5-S0101	13 – 15	0.36	0.00	0.00
T5-S0102	63 – 65	0.21	0.00	0.20

[a] Science Applications International Corporation, 1993***, Fort McClellan Site Investigation Report***, August.

[b] Reported values are below the 0.8 time weighted average (TWA) for the MINICAMS and are determined to be obtained from background sources (USATEU 1992). See Appendix A for TWA definition.

TWA - Time-weighted average.
HD - Distilled mustard.
GB - Sarin.
UX - Nerve agent.

Table 2-4

SI Soil Sample Results
Training Area T-5, Parcel 182(7)[a]
Fort McClellan, Calhoun County, Alabama

SAIC ID Number:				T5-S01	T5-S01	T5-S02	T5-S02
Depth bgs (ft):[b]				(1.0)	(5.0)	(1.0)	(5.0)
Collection Date:				04/22/1992	04/22/1992	04/16/1992	04/16/1992
Associated Field QC Sample:				N/A	N/A	N/A	N/A
				FMP002, FAS001	FMP002, FAS001	FMP002, FAS001	FMP002, FAS001
Parameter	Units	CRL	UCR	RB-004	RB-004	RB-003	RB-003
Method AAA9 (IMPA and MPA in Soil)							
Isopropylmethyl phosphonic acid	µg/g	2.1	40	2.10 LT	2.10 LT	2.10 LT	2.10 LT
Methyl phosphonic acid	µg/g	2	40	2.00 LT	2.00 LT	2.00 LT	2.00 LT
Method LL03 (Organosulfur Compounds in Soil)							
1,4-Oxathiana	µg/g	0.856	17.1	0.856 LT	0.856 LT	0.856 LT	0.856 LT
1,4-Dithiane	µg/g	1.47	11.3	1.47 LT	1.47 LT	1.47 LT	1.47 LT
p-Chlorophenylmethylsulfoxide	µg/g	2.25	45.0	2.25 LT	2.25 LT	2.25 LT	2.25 LT
p-Chlorophenylmethylsulfone	µg/g	2.37	47.4	2.37 LT	2.37 LT	2.37 LT	2.37 LT
Method 99 (Isopropylamine in Soil)							
Isopropylamine	µg/g	NA	NA	1.26 LT	1.20 LT	1.21 LT	1.19 LT
Method LW18 (Thiodiglycol and Chloroacetic Acid in Soil)							
Thiodiglycol	µg/g	3.94	102	3.94 LT	3.94 LT	3.94 LT	3.94 LT
Method TT9 (DIMP and DMMP in Soil)							
Di-isopropylmethylphosphonate	µg/g	0.114	4.57	0.114 LT	0.114 LT	0.114 LT	0.114 LT
Dimethylmethylphosphonate	µg/g	0.133	4.18	0.133 LT	0.133 LT	0.133 LT	0.133 LT

[a] Science Applications International Corporation, 1993, *Fort McClellan Site Investigation Report, August.*
[b] Although the samples appear to be the same as listed in Table 2-3, the sample depths do not match in the SAIC SI report.

NA - Not available.
bgs - Below ground surface.
CRL - Certified reporting limit.
LT - Less than the certified reporting limit.
µg/g - Micrograms per gram.
UCR - Upper certified range.
ft - Feet.
SI - Site investigation.

Table 2-5

SI Surface Water Sample Results[a]
Training Area T-5, Parcel 182(7)
Fort McClellan, Calhoun County, Alabama

SAIC ID Number:				T5-W01
Depth bgs (ft):				(1.0)
Collection Date:				04/15/1992
Associated Field QC Sample:				N/A
				FMP002, FAS001
Parameter	Units	CRL	UCR	RB-003
Method UT02 (IMPA and MPA in Water)				
Isopropylmethyl phosphonic acid	µg/L	100	9,000	100 LT
Methyl phosphonic acid	µg/L	128	9,000	128 LT
Method UL04 (Organosulfur Compounds in Water)				
1,4Oxathiane	µg/L	1.98	39.5	1.98 LT
1,4-Dithiane	µg/L	1.11	22.2	1.11 LT
p-Chlorophenylmethylsulfoxide	µg/L	4.23	106	4.23 LT
p-Chlorophenylmethylsulfone	µg/L	4.72	106	4.72 LT
Method 99 (Isopropylamine in Water)				
Isopropylamine	µg/L	NA	NA	100.0 LT
Method UW22 (TDGCL and TDGCLA in Water)				
Thiodiglycol	µg/L	48.8	4,880	48.8 LT
Method T8 (DIMP and DMMP in Water)				
Di-isopropylmethylphosphonate	µg/L	10.5	209.6	10.5 LT
Dimethylmethylphosphonate	µg/L	15.2	304.8	15.2 LT

[a] Science Applications International Corporation, 1993, *Fort McClellan Site Investigation Report* , August.

NA - Not available.
CRL - Certified reporting limit.
LT - Less than the certified reporting limit.
µg/L - Micrograms per liter.
UCR - Upper certified range.
ft - Feet.
SI - Site investigation.

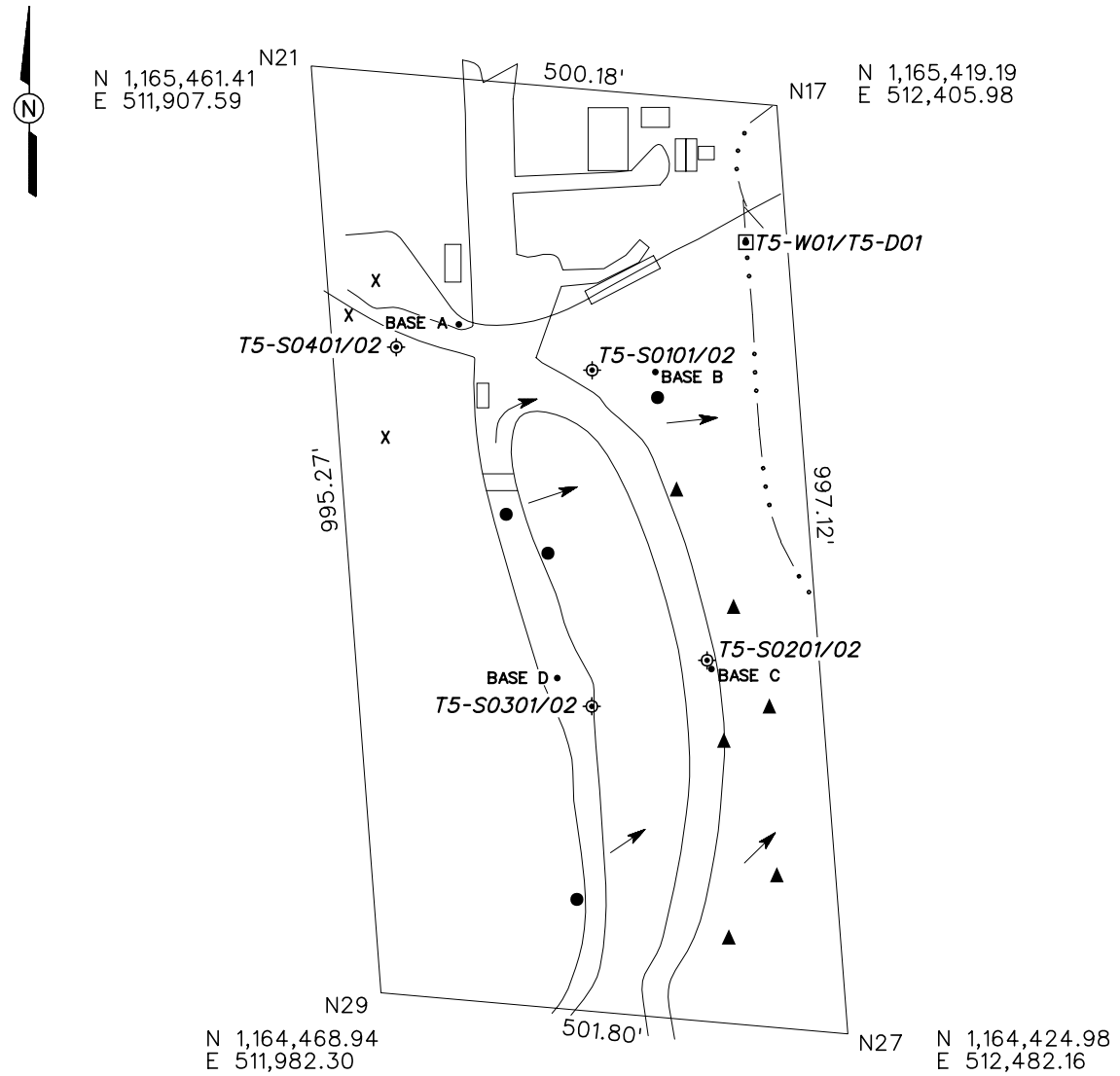
Table 2-6

SI Sediment Sample Results[a]
Training Area T-5, Parcel 182(7)
Fort McClellan, Calhoun County, Alabama

SAIC ID Number: Depth bgs (ft): Collection Date: Associated Field QC Sample: Parameter	Units	CRL	UCR	T5-D01 (1.0) 04/15/1992 N/A FMP002, FAS001 RB-003	T5-D01D (1.0) 04/15/1992 N/A FMP002, FAS001 RB-003
Method AAA9 (IMPA and MPA in Soil)					
Isopropylmethyl phosphonic acid	µg/g	2.10	40	2.10 LT	2.10 LT D
Methyl phosphonic acid	µg/g	2.00	40	2.00 LT	2.00 LT D
Method LL03 (Organosulfur Compounds in Soil)					
1,4-Oxathiane	µg/g	0.856	17.1	0.856 LT	0.856 LT D
1,4-Dithiane	µg/g	1.47	11.3	1.47 LT	1.47 LT D
p-Chlorophenylmethylsulfoxide	µg/g	2.25	45.0	2.25 LT	2.25 LT D
p-Chlorophenylmethylsulfone	µg/g	2.37	47.4	2.37 LT	2.37 LT D
Method LW18 (Thiodiglycol and Chloroacetic Acid in Soil)					
Thiodiglycol	µg/g	3.94	102.0	3.94 LT	3.94 LT D
Method TT9 (DIMP and DMMP in Soil)					
Di-isopropylmethylphosphonate	µg/g	0.114	4.57	0.114 LT	0.114 LT D
Dimethylmethylphosphonate	µg/g	0.133	4.18	0.133 LT	0.133 LT D

[a] Science Applications International Corporation, 1993, *Fort McClellan Site Investigation Report,* August.

CRL - Certified reporting limit.
D - Duplicate sample.
LT - Less than the certified reporting limit.
µg/L - Micrograms per liter.
UCR - Upper certified range.
ft - Feet.
N/A - Not available.
SI - Site investigation.



LEGEND

- SOIL SAMPLING POINT
- DRAINAGE
- POTENTIAL VX SITE
- POTENTIAL GB SITE
- SURFACE WATER/ SEDIMENT SAMPLING POINT
- X HD SITE
- ACCESS ROAD
- INTERMITTENT STREAM

SCALE

0 200 400 FEET

SOURCE: BOUNDARY AND SAMPLES T5-S0401/02, T5-S010/02, T5-S0301/02, T5-S0201/02, AND T5-W01/T5-D01 ARETAKEN FROM, "T5 CHEMICAL AREA-MAIN POST FORT McCLELLAN, ALABAMA EOD REACTION AREA SI SAMPLE LOCATIONS FIGURE 3-4", SCIENCE APPLICATIONS INTERNATIONAL CORPORATION, 1993, "FORT McCLELLAN SITE INVESTIGATION REPORT", AUGUST.

FIGURE 2-2
SI SOIL SAMPLE LOCATIONS
TRAINING AREA T-5
PARCEL 182(7)

U. S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

IT CORPORATION
A Member of The IT Group

STARTING DATE: 1/11/00 | DATE LAST REV.: | DRAFT. CHCK. BY: | INITIATOR: J. RAGSDALE | DWG. NO.: ...\796887es.027
DRAWN BY: D. BILLINGSLEY | DRAWN BY: | ENGR. CHCK. BY: J. RAGSDALE | PROJ. MGR.: J. YACOUB | PROJ. NO.: 796887

10/06/00 03:20:37 DBILLING c:\cadd\design\796887es.027

(SAIC, 1995). Ordnance was observed at Training Area T-5 that appeared to be the result of recent U.S. Army training using dummy rounds (SAIC, 1995).

Four surface soil samples were collected from Training Area T-5 during the RI to enhance coverage of the site (Figure 2-3). The sampled locations were selected based on areal MINICAMS screening data, historical training locations, and the locations of previous SI soil sample analyses (SAIC, 1993). Previous SI shallow soil sampling and analysis at the site was conducted at four locations at depths of l foot and 5 feet below grade (SAIC, 1993). Field screening and laboratory analysis for HD, GB, and VX breakdown products did not detect the presence of chemical agent or chemical agent degradation products in any of the shallow soil samples collected from Training Area T-5 (Table 2-7).

Two sediment samples (T5-D03 and T5-D02) were collected upstream and downstream of Training Area T-5 from a stream tributary adjacent (east) of the site (Figure 2-3). The samples were analyzed for volatile organic compounds, semivolatile organic compounds, pesticides/ polychlorinated biphenyls, explosive compounds, metals, and HD, GB, and VX breakdown products. Two common laboratory contaminants (benzyl alcohol and di-N-butyl phthalate) were the only organic compounds detected in the sediment samples from Training Area T-5 (Table 2-7). Trace metals, including lead (16.2 to 260 micrograms per gram [µg/g]) and arsenic (4.3 to 14.5 µg/g), were detected in the sediment samples. Only, naturally occurring concentrations of trace metals were detected in the surface water samples (Table 2-7).

Ecological Exposure Assessment. Habitat appropriate for terrestrial biota is present at Training Area T-5, so it is necessary to evaluate exposures to terrestrial receptors at the site. Potential exposures at Training Area T-5 occur in surface soil and in surface water and sediment in the nearby creek that could contain runoff products from Training Area T-5. Therefore, risks to floating aquatic plants and other biota and to sediment-dwelling invertebrates and rooted aquatic plants were evaluated for Training Area T-5. Surface soil samples collected at Training Area T-5 were analyzed for agent breakdown products only (SAIC, 1999).

Surface water and sediment analyses included one sample of each sample type for agent breakdown products only and two samples of each sample type for the full suite of selected analyses (SAIC, 1999). The site-related surface water contaminants that exceeded screening values were aluminum, barium, iron, manganese, and zinc. The site-related sediment

Table 2-7

RI Soil/Sediment/Surface Water Sample Results Summary[a]
Training Area T-5, Parcel 182(7)
Fort McClellan, Calhoun County, Alabama

Site ID:			T5-D02	T5-D03	T5-S05	T5-S06	T5-S07	T5-S08	T5-W02	T5-W03
Field Sample Number:			SAIC01	SAIC01	SAIC01	SAIC01	SAIC01	SAIC01	SAIC01	SAIC01
Site Type:			Sediment	Sediment	Soil	Soil	Soil	Soil	Surface Water	Surface Water
Collection Date:			06/06/1994	06/06/1994	05/10/1994	05/10/1994	05/10/1994	05/10/1994	06/08/1994	06/08/1994
Depth (ft):			0	0	1	1	1	0		
Associated Field QC Sample - Site ID:					T38-S10	T38-S10	T38-S10	T38-S10		
Associated Field QC Sample - Field Sample No.:					SAICRB18	SAICRB18	SAICRB18	SAICRB18		
Associated Field QC Sample - Site ID:					T5-S05	T5-S05	T5-S05	T5-S05		
Associated Field QC Sample - Field Sample No.:					SAICRB14	SAICRB14	SAICRB14	SAICRB14		
Laboratory ID Number:			UB03615	UB03616	N/A	N/A	N/A	N/A	UB03683	UB03684
Parameter	Units	CRL								
Metals/Soil (µg/g)										
Arsenic	µg/g	2.5	14.5**	4.35**	N/A	N/A	N/A	N/A		
Lead	µg/g	0.467	260**	16.2**	N/A	N/A	N/A	N/A		
Aluminum	µg/g	11.2	6330**	4820**	N/A	N/A	N/A	N/A		
Barium	µg/g	3.29	27.8**	25.1**	N/A	N/A	N/A	N/A		
Calcium	µg/g	25.3	388**	136**	N/A	N/A	N/A	N/A		
Cadmium	µg/g	1.2	2.37**	1.2**	N/A	N/A	N/A	N/A		
Chromium	µg/g	1.04	26.9**	18.4**	N/A	N/A	N/A	N/A		
Copper	µg/g	2.84	58.6**	16.2**	N/A	N/A	N/A	N/A		
Iron	µg/g	6.66	20400**	12900**	N/A	N/A	N/A	N/A		
Potassium	µg/g	131	131**	262**	N/A	N/A	N/A	N/A		
Magnesium	µg/g	10.1	153**	232**	N/A	N/A	N/A	N/A		
Manganese	µg/g	9.87	163**	89.3**	N/A	N/A	N/A	N/A		
Vanadium	µg/g	1.14	26**	15.9**	N/A	N/A	N/A	N/A		
Zinc	µg/g	2.34	111**	33.5**	N/A	N/A	N/A	N/A		
Semivolatiles/Soil/GCMS (µg/g)										
Benzyl alcohol	µg/g	0.032	0.074**	0.056**	N/A	N/A	N/A	N/A		
di-N-butyl phthalate	µg/g	1.3	5.4**	1.8**	N/A	N/A	N/A	N/A		
Metals/Water (µg/L)									721**	1450**
Aluminum	µg/L	112							26.1**	23.8**
Barium	µg/L	2.82							5000**	2060**
Calcium	µg/L	105							1130**	2310**
Iron	µg/L	77.5							1330**	1070**
Magnesium	µg/L	135							161**	142**
Manganese	µg/L	9.67							948**	815**

Table 2-7

RI Soil/Sediment/Surface Water Sample Results Summary[a]
Training Area T-5, Parcel 182(7)
Fort McClellan, Calhoun County, Alabama

Site ID:			T5-D02	T5-D03	T5-S05	T5-S06	T5-S07	T5-S08	T5-W02	T5-W03
Field Sample Number:			SAIC01	SAIC01	SAIC01	SAIC01	SAIC01	SAIC01	SAIC01	SAIC01
Site Type:			Sediment	Sediment	Soil	Soil	Soil	Soil	Surface Water	Surface Water
Collection Date:			06/06/1994	06/06/1994	05/10/1994	05/10/1994	05/10/1994	05/10/1994	06/08/1994	06/08/1994
Depth (ft):			0	0	1	1	1	0		
Associated Field QC Sample - Site ID:					T38-S10	T38-S10	T38-S10	T38-S10		
Associated Field QC Sample - Field Sample No.:					SAICRB18	SAICRB18	SAICRB18	SAICRB18		
Associated Field QC Sample - Site ID:					T5-S05	T5-S05	T5-S05	T5-S05		
Associated Field QC Sample - Field Sample No.:					SAICRB14	SAICRB14	SAICRB14	SAICRB14		
Laboratory ID Number:			UB03615	UB03616	N/A	N/A	N/A	N/A	UB03683	UB03684
Parameter	Units	CRL								
Sodium	µg/L	279							27.3**	28.8**
Zinc	µg/L	18								

[a] Science Applications International Corporation, 1995, *Draft Fort McClellan Remedial Investigation Report* , August.
* Data collected from chemical transfer file (Phase I).
** Data collected from AEC Pyramid system (Phase II).
CRL - Certified reporting limits.
ft - Foot.
ID - Identification.
µg/g - Micrograms per gram.
µg/L - Micrograms per liter.
N/A - Not applicable.
N/F - Analysis requested, not yet received.
QC - Quality control.
TIC - Tentatively identified compound: number of TICs (total value).
Data Qualifiers
I - The low-spike recovery is high.
Boolean Codes
LT - Less than the certified reporting limit/method detection level.
RI - Remedial Investigation.

contaminants that exceeded screening values were found to be arsenic, cadmium, copper, lead, vanadium benzyl alcohol, and di-N-butyl phthalate (SAIC, 1999).

Ecological Risk Characterization. There were not any contaminants detected in soil; therefore, there were not any unacceptable risks to ecological receptors from contaminants in soil found at Training Area T-5 (SAIC, 1999). Surface soil samples at Training Area T-5 were analyzed for chemical warfare agent breakdown products only.

In surface water, the hazard index (HI) was 28.1 (SAIC, 1999). Individual hazard quotients (HQ) for iron and manganese were between 2 and 3, whereas the HQ for aluminum was 16.7, and the HQ for barium was 6.9 (SAIC, 1999). The reasonable maximum exposure concentration of barium (26.1, micrograms per liter) was approximately 25 percent above the background concentration (21 micrograms per liter) (SAIC, 1999). On the basis of potential toxicity to aquatic biota, aluminum, barium, iron, and manganese were identified as chemicals of concern (COC) in surface water at Training Area T-5.

In sediment, the HI was 16.1 (SAIC, 1999). The HQs for arsenic (2.0), cadmium (2.4), copper (3.1), and lead (3.6) exceeded 1 (SAIC, 1999). Because the toxicity benchmarks, effects range medium (ER-M) values, were chosen to be realistic but not overly conservative, these HQs indicate a potential for harm to sediment-exposed biota at Training Area T-5. Consequently, arsenic, cadmium, copper, and lead are identified as ecological COC in sediment at Training Area T-5.

Human Health Risk Assessment. Based on the information presented in the SAIC RI/baseline risk assessment report, there is no current or imminent hazard presents at Training Area T-5 (SAIC, 1999). The human health risk assessment is summarized as follows (SAIC, 1999):

- Target analytes were not detected in any soil samples (Tables 2-4 and 2-7).
- There were not any chemicals of potential concern for surface water or sediment; therefore, HIs and cancer risks for surface water and sediment pathways were all below limits (SAIC, 1999).

Former Former Detection and Identification Area (Parcel 180[7]). The Former Former Detection and Identification Area, Parcel 180[7] is an about one-half-acre site that was used from

the 1950s to 1972 for GB and possibly HD training. Agent simulants carbonyl chloride, cyanogen chloride, dichloroformoxine, and hydrogen cyanide also may have been used in training. The training aids from this site and a building from Site T-4 were burned twice in a dug pit and buried at the Former Detection and Identification Area. The pit is identified by monument F, which was located in the field during the October 1991 and April 1992 site visits (SAIC, 1993). The site was investigated by collecting soil samples at two locations in the area.

Four soil samples (two from each location) were collected at two locations in the vicinity of Stake F in the Former Detection and Identification Area (Figure 2-4). The samples were screened in the field for HD and GB using a MINICAMS analyzer. The results of the screening (Table 2-8) indicate that TWA values ranged between 0.0 to 0.03 TWA and are below the threshold limit of 0.8 TWA. HD and GB were not detected in the field screening samples (SAIC, 1993). Laboratory analyses were conducted for HD and GB degradation products and metals. The results of these analyses show that agent breakdown compounds were not detected in the soil samples (SAIC, 1993). Metals were detected in the soil samples. Detected results are presented in Table 2-9.

Samples collected from two high-probability locations at the Former Detection and Identification Area did not indicate the presence of CWA or agent breakdown products in the subsurface soils (SAIC, 1993). Metals concentrations in the soils are naturally occurring and do not represent an environmental hazard (SAIC, 1993). The location of a disposal pit in which training materials were burned is reportedly marked by a surface monument (monument F), which was located in the field (SAIC, 1993). The dimensions of the pit are unreported and the position of monument F with respect to the pit boundary is unknown.

An RI was conducted at the Former Detection and Identification Area located on FTMC. The objectives of the study were to investigate the presence, nature, and extent of potential environmental contamination resulting from previous controlled U.S. Army chemical CWA training activities and uncontrolled munitions and municipal waste disposal (SAIC, 1995). The Former Detection and Identification Area was investigated by intrusive trenching and soil sampling in the vicinity of concrete monument “F” and geophysical surveying by SAIC as part of the initial RI (SAIC, 1995). The site area is heavily wooded and few indicators of former military training are evident at the site. Geophysical surveying in the vicinity of monument “F”

Table 2-8

USATEU Results of the SI MINICAMS Screening Detection and Identification Area, Parcel 180(7) [a] Fort McClellan, Calhoun County, Alabama

Sample Number	Sample Depth (inches)	HD[b] (TWA)	GB* (TWA)
DIA-S0101	12 - 18	0.03	0.00
DIA-S0102	70 - 76	0.03	0.00
DLA-S0201	12 - 15	0.03	0.00
DIA-S0202	70 - 76	0.03	0.00

[a] Science Applications International Corporation, 1993, *Fort McClellan Site Investigation Report*, August.

[b] Reported values are below the 0.8 time weighted average (TWA) for the MINICAMS and are not indicative of detected chemical warfare agent (USATEU, 6/92). See Appendix A for TWA definition.

TWA – Time weighted average.
HD – Distilled mustard.
GB – Sarin.
SI – Site investigation.

Table 2-9

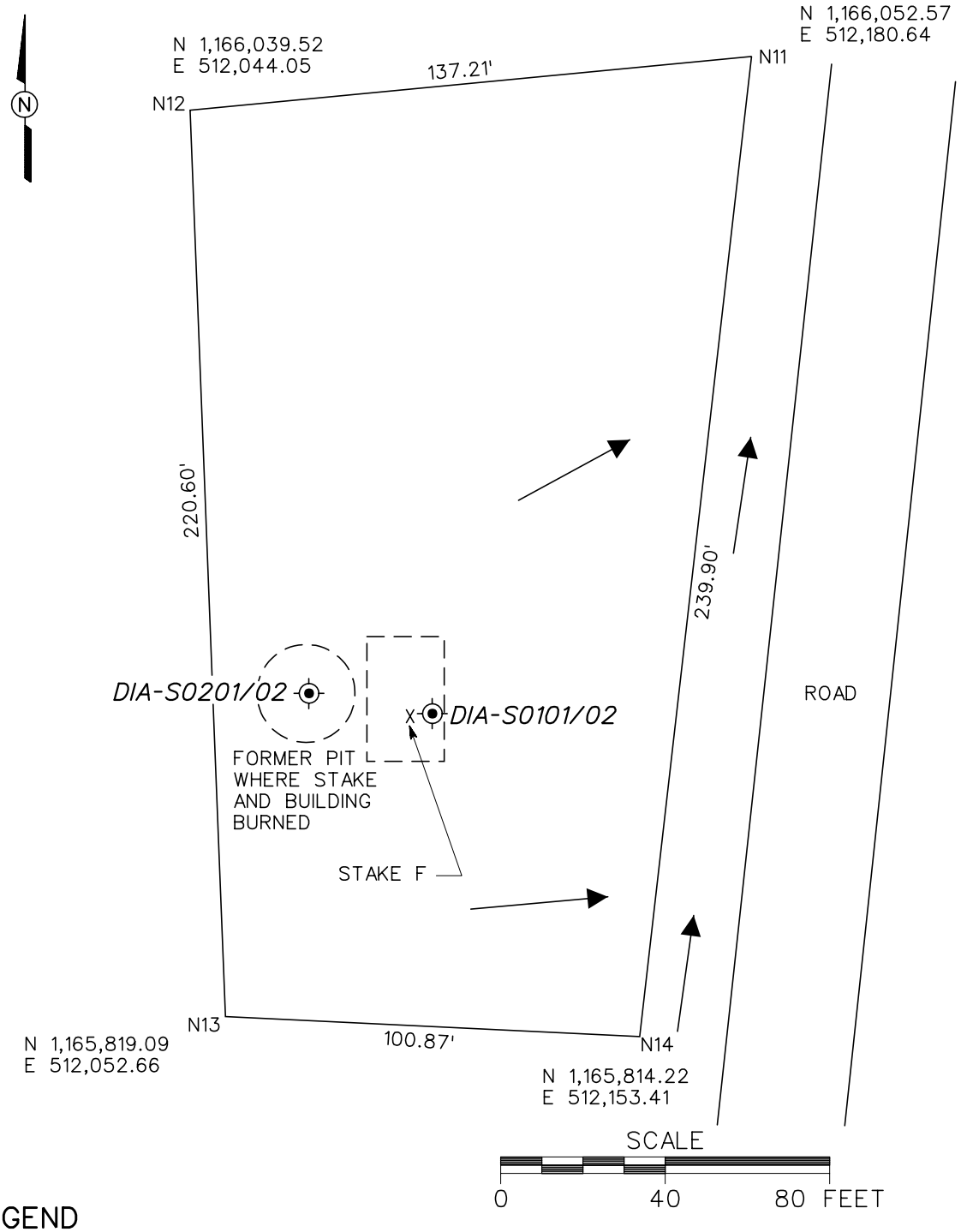
SI Soil Sample Results Summary[a]
Former Detection and Identification Area, Parcel 180(7)
Fort McClellan, Calhoun County, Alabama

SAIC ID Number:				DIA-S01	DIA-S01D	DIA-S01	DIA-S02	DIA-S02
Depth bgs (ft):[b]				(1.0)	(1.0)	(5.0)	(1.0)	(5.0)
Collection Date:				04/15/1992	04/15/1992	04/15/1992	04/16/1992	04/15/1992
Associated Field QC Sample:				TB-007	TB-007	TB-007	TB-007	TB-007
				FMP002, FAS001	FMP002, FAS001	FMP002, FAS001	FMP002, FAS001	FMP002, FAS001
Parameter	Units	CRL	UCR	RB-003	RB-003	RB-003	RB-003	RB-003
Method B9 (As in Soil)								
Arsenic	µg/g	2.50	50.0	17.3	18.9 D	16.7	11	21.9
Method JS12 (ICP Metals in Soil)								
Aluminum	µg/g	11.2	50,000	23,900	21,200 D	29,800	15,600	27,900
Barium	µg/g	3.29	1,000	60.5	58.7 D	76.9	67	70.9
Beryllium	µg/g	0.427	1,000	0.861	1.31 D	0.705	0.904	0.806
Boron	µg/g	6.64	1,000	6.64 LT	11.9 D	6.64 LT	6.64 LT	6.64 LT
Calcium	µg/g	25.3	50,000	302	300 D	833	462	87.9
Chromium	µg/g	1.04	1,000	27.8	32.3 D	33.7	26.2	27.2
Cobalt	µg/g	2.50	1,000	10.4	16.8 D	6	6.94	4.57
Copper	µg/g	2.84	1,000	11.3	12.1 D	16.8	38.5	20.2
Iron	µg/g	6.66	50,000	45,200	8,150 D	44,100	48,000	48,100
Magnesium	µg/g	10.1	50,000	792	692 D	1,030	656	1,300
Manganese	µg/g	9.87	1,000	202	310 D	167	373	53.7
Nickel	µg/g	2.74	2,000	11	22.3 D	12.8	15.4	15.5
Potassium	µg/g	131	50,000	887	683 D	1,340	524	1,320
Tin	µg/g	7.43	2,000	7.43 LT	7.43 LT D	7.43 LT	10.6	7.43 LT
Vanadium	µg/g	1.41	1,000	42.1	45.9 D	46.2	30.2	41.2
Zinc	µg/g	2.34	1,000	32.7	40.6 D	56.9	29.1	49.5
Lead	µg/g	7.44	1,000	13.8	24.6 D	42.2	8.98	12.8

[a]Science Applications International Corporation, 1993, *Fort McClellan Site Investigation Report* , August.

[b]Although the samples appear to be the same as listed in Table 2-8, the sample depths do not match in the SAIC SI report.

CRL - Certified reporting limit.
D - Duplicate sample.
LT - Less than the certified reporting limit.
µg/L - Micrograms per liter.
UCR - Upper certified range.
ft - Foot.
SI - Site investigation.



LEGEND

SOIL SAMPLING POINT

SURFACE DRAINAGE

SOURCE: BOUNDARY AND SAMPLES DIA-S0201/02 AND DIA-S0101/02 TAKEN FROM, "DETECTION AND IDENTIFICATION AREA-MAIN POST FORT McCLELLAN, ALABAMA SI SAMPLE LOCATIONS FIGURE 3-18", SCIENCE APPLICATIONS INTERNATIONAL CORPORATION, 1993, "FORT McCLELLAN SITE INVESTIGATION REPORT", AUGUST.

FIGURE 2-4
SI SOIL SAMPLE LOCATIONS FORMER DETECTION AND IDENTIFICATION AREA PARCEL 180(7)

U. S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

IT CORPORATION
A Member of The IT Group

STARTING DATE: 1/10/00 | DATE LAST REV.: | DRAFT. CHCK. BY: | INITIATOR: J. RAGSDALE | DWG. NO.: ...\796887es.029
DRAWN BY: D. BILLINGLSEY | DRAWN BY: | ENGR. CHCK. BY: J. RAGSDALE | PROJ. MGR.: J. YACOUB | PROJ. NO.: 796887

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consisted of electromagnetic (EM-31) and magnetometer investigations. The trench, sample, and geophysical transect locations are shown on Figure 2-5.

Geophysical measurements at the Former Detection and Identification Area were obtained along four transects centered over concrete monument "F" at the site (Figure 2-5). The 120-foot-long lines were arranged in a star pattern, with four lines designated as Lines 1, 2, 3, and 4. Frequency domain electromagnetic (EM31) and magnetometer measurements were obtained on ten intervals along each transect (SAIC, 1995, 1999). The results of the geophysical investigation are shown in Figure 2-6 which was reproduced as presented in the SAIC RI report (SAIC, 1995). However, Anomalies 1, 2, and 3, discussed below, were not labeled on the figure in the SAIC RI report, and, therefore, are not labeled in Figure 2-6.

Anomalous frequency domain electromagnetic readings were observed at numerous stations in the Former Detection and Identification Area. Anomaly 1 correlates to a central conductivity (quadrature phase) and in-phase high that is centered approximately on concrete monument "F (SAIC, 1995, 1999)." The response of both conductivity and in-phase signals suggests that metallic material is buried in this area. The relative difference between the size of the anomaly as observed in the horizontal and vertical mode data may be caused by target geometry at depth. Since the vertical dipole mode attains a greater depth of investigation than the horizontal mode, data collected using the two modes may be used qualitatively to estimate the depth to the source target (SAIC, 1995). Based on this comparison, the source of the anomaly may be less than 10 feet deep. In all cases, the in-phase component shows a pattern for Anomaly 1 similar to the conductivity or quadrature component, implying that Anomaly 1 is associated with metallic material, since the in-phase component is particularly sensitive to metallic material.

Anomalies 2 and 3 are observed in vertical mode conductivity data in the south and southwest portions of the survey area (SAIC, 1995, 1999). The source of the anomaly is interpreted to be nonmetallic, since the in-phase response in this area was not observed to be anomalous (SAIC, 1995, 1999). The anomaly source is estimated to be deeper than the investigation depth for the horizontal mode (about 10 feet), since no response is noted in the horizontal mode data. Targets that could result in such a response may include buried nonmetallic material, such as unreinforced concrete or other refuse, surface or subsurface lithologic variations, or contaminants migrating in the subsurface. A surface source for the anomalies was not observed at the site.

A single, dipolar magnetic anomaly was observed in the magnetic and vertical magnetic gradient data (SAIC, 1995). The anomaly pattern is characteristic of an anomaly arising from the induced magnetization of a buried ferromagnetic target in the northern hemisphere, with a relative positive anomaly component oriented to the south and a relative negative anomaly component oriented to the north. Semiquantitative calculations using the steepest slope of the anomaly observed on the north to south oriented profile produced a depth of burial estimate between 10 to 13 feet. The lack of any magnetic anomaly toward the south to southwest portions of the site suggest a lack of ferromagnetic material, which agrees with the frequency domain electromagnetic interpretation.

Additional MINICAMS soil screening was conducted by USATEU at the Former Detection and Identification Area during the RI study on 21 soil samples that were obtained from "gridded" locations and from samples collected from excavated trenches at monument "F" (SAIC, 1999). Surface sample locations DI-1 to DI-13 were screened to obtain spatial coverage across the entire study area, to supplement previous sampling at the locations of historical training activity, and to fill gaps in the overall site coverage. The soil samples were obtained by USATEU from 0.5-foot bgs and were analyzed for HD, GB, and VX. Additional screening was conducted on subsurface soil samples from test pits (TP-1 and TP-2) to depths between 2.5 to 6.5 feet bgs. Chemical warfare agents were not detected above the 0.8 TWA (instrumental baseline) in any of the screened samples (SAIC, 1999). The results of RI MINICAMS screening on soil samples from the Former Detection and Identification Area are shown in Table 2-10.

Test trenches were excavated by USATEU within the Former Detection and Identification Area (SAIC, 1995) (Figure 2-5). Excavated materials from the test pits included construction debris (concrete, rebar). One soil sample was collected from each of the pits and analyzed for HD and GB breakdown products. Chemical agent breakdown products were not detected in any of the samples analyzed (SAIC, 1995).

Intrusive investigation at the Former Detection and Identification Area was conducted in May, 1994. Trenches were excavated by the USATEU adjacent to monument "F" at the study area to investigate training and construction materials that were potentially buried at the site. Perpendicular trench alignments were excavated adjacent to the monument and extending over total lengths of approximately 25 feet. Intrusive trenching at monument "F" generally encountered quantities of concrete rubble with rebar, wood (including burnt wood and painted lumber [2 by 6 inches]), sand, and tar paper. Sections of a 4.5-inch pipe and 4.5 inch pipe

Table 2-10

RI MINICAMS Soil Screening Results[a]
Former Detection and Identification Area, Parcel 180(7)
Fort McClellan, Calhoun County, Alabama

Sample Number	Sample Depth bgs (ft)	Date	HD (TWA)[b]	VX (TWA)	GB (TWA)
DI-1	0.5	05/17/94	0.00	0.00	0.00
DI-2	0.5	05/11/94	0.00	0.00	0.01
DI-2	0.5	05/17/94	0.00	0.02	0.01
DI-3	0.5	05/17/94	0.00	0.17	0.00
DI-4	0.5	05/11/94	0.00	0.00	0.01
DI-5	0.5	05/11/94	0.00	0.00	0.01
DI-6	0.5	05/17/94	0.00	0.00	0.00
DI-7	0.5	05/11/94	0.00	0.00	0.01
DI-8	0.5	05/17/94	0.00	0.00	0.00
DI-9	0.5	05/17/94	0.00	0.00	0.00
DI-10	0.5	05/17/94	0.00	0.00	0.01
DI-11	0.5	05/17/94	0.00	0.00	0.01
DI-12	0.5	05/17/94	0.00	0.00	0.01
DI-13	0.5	05/17/94	0.00	0.02	0.00
DI-T1S-1	2.5	05/12/94	0.03	0.00	0.01
DI-T1S-2	6.5	05/12/94	0.00	0.00	0.01
DI-T1N-3	4.5	05/16/94	0.00	0.00	0.01
DI-T2W-1	5.0	05/12/94	0.00	0.00	0.01
DI-T2W-2	5.5	05/13/94	0.00	0.00	0.01
DI-T2W-3	6.5	05/16/94	0.00	0.00	0.01
DI-T2E-4	4.5	05/16/94	0.00	0.00	0.01
DI-T2E-5	5.0	05/17/94	0.00	0.00	0.00

[a]Science Applications International Corporation, 1999, *Draft Final Fort McClelan Remedial Investigation/Baseline Risk Assessment Report*, February.
[b]See Appendix A for TWA definition.

ft - Foot.
HD - Distilled mustard.
VX - Nerve agent.
GB - Sarin.
TWA - Time weighted average.
RI - Remedial investigation.

embedded in concrete were encountered at a depth of 6.5 feet bgs. Training-related materials that were excavated at the Former Detection and Identification Area consisted of glass tube fragments (potentially from an M-18 test kit) and a rubber (chemical) glove. CWA screening of the glove was negative. Water was encountered in the trenched area at a depth of 6.5 to 7 feet bgs.

Four subsurface soil samples (DIA-S03 to DIA-S06) were collected during the RI study from within the excavated test pits inside the fence (Figure 2-5). Samples were analyzed for HD and GB breakdown products. All subsurface samples were screened by the USATEU for the presence of CWA prior to submission to the laboratory. The results of soil sample analyses at the Former Detection and Identification Area are provided on Table 2-11.

CWA breakdown products were not detected in the soil samples obtained from the Former Detection and Identification Area in 1992 and 1994 (SAIC, 1999). Inorganic constituents that exceed background concentrations in soil samples obtained between 1 and 5 feet bgs included aluminum (18,200 to 38,000 µg/g), chromium (42.4 µg/g), cobalt (19.4 µg/g), copper (22.1 to 46.2 µg/g), iron (53,700 to 97,000 µg/g), lead (52.1 µg/g), nickel (15.4 to 24.9 µg/g), and zinc (34.4 to 73.5 µg/g) (SAIC, 1999).

Ecological Exposure Assessment. Abundant habitat and evidence of use of the Former Detection and Identification Area by wildlife require an evaluation of risks from site-related constituents. Surface soil samples taken at the Former Detection and Identification Area include two samples analyzed for GB and HD breakdown products and inorganics only. The site-related soil constituents that exceeded screening values were boron, chromium, and tin (SAIC, 1999).

Ecological Risk Characterization. For soil exposure, the HQs at the Former Detection and Identification Area were 1.1 for white-footed mouse, 7.0 for woodcock, and less than 1 for deer and red-tailed hawk (SAIC, 1999). HQs for the mouse slightly exceed 1, so there is probably no unacceptable risk to mammals on the site (SAIC, 1999).

The HQ for grasses, forbs, and trees was 340, predominantly for toxicity of boron (SAIC, 1999). It is unlikely that the available concentration of chromium in soil is as high as the measured total concentration; chromium in soil is usually in an insoluble form of chromium (III). The solubility of boron in soil is also likely to be low: the abundance of grasses, forbs, and trees at the Former

Table 2-11

RI Soil Sample Results Summary[a]
Former Detection and Identification Area, Parcel 180(7)
Fort McClellan, Calhoun County, Alabama

Site ID:		DIA-S01	DIA-S01	DIA-S01	DIA-S02	DIA-S02	DIA-S03	DIA-S03	DIA-S04
Field Sample Number:		DIA-S0101	DIA-S0101D	DIA-S0102	DIA-S0201	DIA-S0202	SAIC01	SAIC02D	SAIC01
Sample Location Type:		Boring	Boring	Boring	Boring	Boring	Excavation	Excavation	Excavation
Collection Date:		04/15/1992	05/04/1992	04/15/1992	04/15/1992	04/15/1992	05/16/1994	05/16/1994	05/16/1994
Depth bgs (ft):		1	1	5	1	5	6	6	6
Laboratory Number		TAC008	TAC010	TAC011	TAC012	TAC013			
Parameter	Units								
Metals									
Aluminum	µg/g	28,200	25,200 D	38,000	18,200	34,700	N/A	N/A	N/A
Arsenic	µg/g	17.3 R	18.9 D R	16.7 R	11.0 R	21.8 R	N/A	N/A	N/A
Barium	µg/g	71.4	69.6 D	98.0	77.9	88.0	N/A	N/A	N/A
Beryllium	µg/g	1.06 R	1.62 D	0.936 R	1.10 R	1.04 R	N/A	N/A	N/A
Cadmium	µg/g	LT 1.20	LT 1.20 D	LT 1.20	LT 1.20	LT 1.20	N/A	N/A	N/A
Calcium	µg/g	359	356 D	1,060	538	109	N/A	N/A	N/A
Chromium	µg/g	32.4	37.8 D	42.4	30.1	33.3	N/A	N/A	N/A
Cobalt	µg/g	11.9	19.4 D	7.44	7.85	5.52	N/A	N/A	N/A
Copper	µg/g	13.8	14.8 D	22.1	46.2	25.9	N/A	N/A	N/A
Iron	µg/g	53,700	97,000 D	56,600	56,200	60,200	N/A	N/A	N/A
Lead	µg/g	15.8	28.3 D	52.1	10.1	15.4	N/A	N/A	N/A
Magnesium	µg/g	927	814 D	1,300	757	1600	N/A	N/A	N/A
Manganese	µg/g	235	383 D	210	428	65.8	N/A	N/A	N/A
Mercury	µg/g	LT 0.0500	LT 0.0500 D	LT 0.0500	LT 0.0500	LT 0.0500	N/A	N/A	N/A
Nickel	µg/g	12.2	24.9 D	15.4	16.9	18.1	N/A	N/A	N/A
Potassium	µg/g	1,070	829 D	1,750	624	1,680	N/A	N/A	N/A
Selenium	µg/g	LT 0.449	N/A	0.449	LT 0.449	LT 0.449	N/A	N/A	N/A
Silver	µg/g	LT 0.803	LT 0.803 D	0.803	LT 0.803	LT 0.803	N/A	N/A	N/A
Sodium	µg/g	LT 38.7	LT 38.7 D	38.7	LT 38.7	LT 38.7	N/A	N/A	N/A
Vanadium	µg/g	48.6	53.2 D	57.6	34.4	50	N/A	N/A	N/A
Zinc	µg/g	39.2	48.8 D	73.6	34.4	62.4	N/A	N/A	N/A

Table 2-11

RI Soil Sample Results Summary[a]
Former Detection and Identification Area, Parcel 180(7)
Fort McClellan, Calhoun County, Alabama

Site ID:		DIA-S01	DIA-S01	DIA-S01	DIA-S02	DIA-S02	DIA-S03	DIA-S03	DIA-S04
Field Sample Number:		DIA-S0101	DIA-S0101D	DIA-S0102	DIA-S0201	DIA-S0202	SAIC01	SAIC02D	SAIC01
Sample Location Type:		Boring	Boring	Boring	Boring	Boring	Excavation	Excavation	Excavation
Collection Date:		04/15/1992	05/04/1992	04/15/1992	04/15/1992	04/15/1992	05/16/1994	05/16/1994	05/16/1994
Depth bgs (ft):		1	1	5	1	5	6	6	6
Laboratory Number		MCSAS*9	MCSAS*10	MCSAS*11	MCSAS*12	MCSAS*13	MCBS*5	MCBS*9	MCBS*12
Parameter	Units								
GB/VX Breakdown Product									
Chloroacetic acid	µg/g	N/A	N/A	N/A	N/A	N/A	LT 0.500	LT 0.500 D	LT 0.500
Di-isopropyl methylphosphonate	µg/g	LT 0.114	LT 0.114 D	LT 0.114	LT 0.114	LT 0.114	LT 0.114	LT 0.114 D	LT 0.114
Dimethyl methylphosphonate	µg/g	LT 0.133	LT 0.133 D	LT 0.133	LT 0.133	LT 0.133	LT 0.133	LT 0.133 D	LT 0.133
Fluoroacetic acid	µg/g	N/A	N/A	N/A	N/A	N/A	LT 0.182	LT 0.182 D	LT 0.182
Isopropyl methylphosphonate	µg/g	LT 2.11	LT 2.11 D	LT 2.11	LT 2.11	LT 2.11	LT 0.500	LT 0.500 D	LT 0.500
Methylphosphonic acid	µg/g	LT 2.00	LT 2.00 D	LT 2.00	LT 2.00	LT 2.00	LT 0.500	LT 0.500 D	LT 0.500
HD Breakdown Product									
Benzothiazole	µg/g	N/A	N/A	N/A	N/A	N/A	LT 1.08	LT 1.08 D	LT 1.08
Dimethyl sulfide	µg/g	N/A	N/A	N/A	N/A	N/A	LT 0.692	LT 0.692 D	LT 0.692
Thiodiglycol	µg/g	LT 3.94	LT 3.94 D	LT 3.94	LT 3.94	LT 3.94	LT 3.94	LT 3.94 D	LT 3.94

[a] Science Application International Corporation, 1999, *Draft Final Fort McClellan Remedial Investigation/Baseline Risk Assessment Report* , February.

N/A - Not applicable.
Boolean Codes
LT - Less than the certified reporting limit.
Flagging Codes
D - Duplicate analysis.
Qualifiers
R - Data is rejected.
ft - Foot.
GB - Sarin.
VX - Nerve agent.
HD - Distilled mustard.
RI - Remedial investigation.

Detection and Identification Area indicates that toxicity to plants is not of major concern at the site. Therefore, no ecological COC were identified for plants at the Former Detection and Identification Area.

Human Health Risk Assessment. Based on the information presented in the SAIC RI/baseline risk assessment report, there is no current or imminent hazard present at the Former Detection and Identification Area (SAIC, 1999). The human health risk assessment is summarized as follows (SAIC, 1999):

- HIs below 1 for all receptors except the resident child exposed to the subsurface soil. Iron is the primary COC in soil (HQ>1), although aluminum and chromium are lesser noncancer COC.

- The greatest cancer risk is for inhalation by the industrial worker, at 1 X 10^{-5} (SAIC, 1999).

Old Toxic Training Area (Parcel 188). The Old Toxic Training Area consists of an approximately 1-acre area behind Building 3183 that was used for training exercises in the identification and detection of HD in the 1950s. The area was fenced, but is now accessible because of fence breaks due to age and lack of maintenance. Possible HD contamination at this site was investigated with two shallow soil borings. The USATEU collected four shallow soil samples (two at each location) at two locations within the Old Toxic Training Area (Figure 2-7). The samples were screened in the field for the presence of HD using a MINICAMS analyzer. The screening values were less than the 0.8 TWA threshold for HD and detected values were below the detection limit for HD. The results of the field screening are shown in Table 2-12. Laboratory analysis of the soil samples for HD degradation products did not detect these compounds at the sampled locations (SAIC, 1993). The results of the laboratory testing are shown in Table 2-13.

Field screening and laboratory analysis did not indicate the presence of HD contamination at two sampled locations within the Old Toxic Training Area ditch (SAIC, 1993).

Table 2-12

USATEU Results of MINICAMS Soil Screening[a], Old Toxic Training Area, Parcel 188(7) Fort McClellan, Calhoun County, Alabama

Sample Number	Sample Depth bgs (inches)	HD (TWA)[b]
OTA-S0101	12 - 15	0.00
OTA-S0102	58 - 60	0.04
OTA-S0201	12 - 15	0.03
OTA-S0202	62 - 64	0.05

[a]A Science Applications International Corporation, 1993***, Fort McClellan Site Investigation Report***, August.

[b]Reported values are below the 0.8 time weighted average (TWA) for the MINICAMS and are not indicative of detected chemical warfare agent (USATEU, 6/92). See Appendix A for TWA definition.

TWA – Time-weighted average.

Table 2-13

SI Soil Sample Results
Old Toxic Training Area, Parcel 188(7)[a]
Fort McClellan, Calhoun County, Alabama

SAIC ID Number:				OTA-S01	OTA-S01D	OTA-S01	OTA-S02	OTA-S02
Depth bgs (ft):[b]				(1.0)	(1.0)	(5.0)	(1.0)	(5.0)
Collection Date:				04/14/1992	04/14/1992	04/14/1992	04/14/1992	04/14/1992
Associated Field QC Sample:				FAS001	FAS001	FAS001	FAS001	FAS001
				FMP002	FMP002	FMP002	FMP002	FMP002
Parameter	Units	CRL	UCR	RB-002	RB-002	RB-002	RB-002	RB-002
Method LL03 (Organosulfur Compounds in Soil)								
1,4-Oxiathiane	µg/g	0.856	17.1	0.856 LT	0.856 LT D	0.856 LT	0.856 LT	0.856 LT
1,4-Dithiane	µg/g	1.47	11.3	1.47 LT	1.47 LT D	1.47 LT	1.47 LT	1.47 LT
p-Chlorophenylmethylsulfoxide	µg/g	2.25	45.0	2.25 LT	2.25 LT D	2.25 LT	2.25 LT	2.25 LT
p-Chlorophenylmethylsulfone	µg/g	2.37	47.4	2.37 LT	2.37 LT D	2.37 LT	2.37 LT	2.37 LT
Method LW18 (Thiodiglyocol and Chloroacetic Acid in Soil)								
Thiodiglycol	µg/g	3.94	102.0	3.94 LT	3.94 LT D	3.94 LT	3.94 LT	3.94 LT

[a]Science Applications International Corporation, 1995, *Draft Fort McClellan Remedial Investigation Report* , August.
[b]Although the samples appear to be the same as listed in Table 2-12, the sample depths do not match in the SAIC SI report.

bgs - Below ground surface.
CRL - Certified reporting limit.
D - Duplicate sample.
LT - Less than the certified reporting limit/method detection level.
UCR - Upper certified range.
SI - Site investigation.
ft - Foot.

DRAFT. CHCK. BY:
ENGR. CHCK. BY: J. RAGSDALE
INITIATOR: J. RAGSDALE
PROJ. MGR.: J. YACOUB
DWG. NO.: ...\796887es.031
PROJ. NO.: 796887
DATE LAST REV.:
DRAWN BY:
STARTING DATE: 1/10/00
DRAWN BY: D. BILLINGSLEY
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E 668,000

E 668,200

E 668,400

N 1,167,300

N 1,167,100

N 1,166,900

800

805

810

815

820

825

23 RD STREET

13 TH AVE.

3182

3183

PARKING AREA

188(7)
.95 acres

OTA-S0101/02

OTA-S0201/02

TRAINING AREA DITCH

CONCRETE LINED DITCH

FENCE

OLD UNUSED ROAD

WOODY AREA
LARGE PINE TREES

PARKING

SCALE
0 50 100 FEET

LEGEND

- UNIMPROVED ROADS AND PARKING
- PAVED ROADS AND PARKING
- BUILDING
- TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL - 5 FOOT)
- TREES / TREELINE
- PARCEL BOUNDARY
- UTILITY POLE
- MANHOLE
- UNDERGROUND CULVERT WITH HEADWALL
- MANMADE SURFACE DRAINAGE FEATURE
- HISTORICAL FEATURES, SAIC, 1993
- SAIC SUBSURFACE SOIL SAMPLE LOCATION

SOURCE: SCIENCE APPLICATIONS INTERNATIONAL CORPORATION, 1993, "FORT McCLELLAN SITE INVESTIGATION REPORT", AUGUST.

FIGURE 2-7
SI SOIL SAMPLE LOCATIONS
OLD TOXIC TRAINING AREA
PARCEL 188(7)

U. S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

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3.0 Site-Specific Data Quality Objectives

3.1 Overview

The data quality objective (DQO) process is followed to establish data requirements. This process ensures that the proper quantity and quality of data are generated to support the decision-making process associated with the action selection for the CWM sites, Parcels 509(7), 183(6), 511(7), 512(7), 513(7), 516(7), 182(7), 180(7), 514(7), 517(7), and 188(7) associated with this SI. This section incorporates the components of the DQO process described in the publication EPA 540-R-93-071 *Data Quality Objectives Process for Superfund* (EPA, 1993). The DQO process as applied to the CWM sites associated with this SI is described in more detail in Section 4.3 of the WP. Table 3-1 provides a summary of the factors used to determine the appropriate quantity of samples, and the procedures necessary to meet the objectives of the SI and establish a basis for future action at these CWM sites.

The samples will be analyzed using EPA SW-846 methods, including Update III Methods where applicable, as presented in Chapter 4.0 in this SFSP and Table 6-1 in the QAP. Data will be reported and evaluated in accordance with Corps of Engineers South Atlantic Savannah (CESAS) Level B criteria (USACE, 1994) and the stipulated requirements for the generation of definitive data (Section 3.1.2 of the QAP). Chemical data will be reported via hard copy data packages by the laboratory using Contract Laboratory Program-like forms along with electronic copies. These packages will be validated in accordance with EPA National Functional Guidelines by Level III criteria.

3.2 Data Users and Available Data

The available data, presented in Table 3-1, related to the SI at the CWM sites, have been used to formulate a site-specific conceptual model. This conceptual model was developed to support the development of this SFSP, which is necessary to meet the objectives of these activities and to establish a basis for future action at the site. The data users for the data and information generated during field activities are primarily EPA, USACE, ADEM, FTMC, and the USACE supporting contractors. This SFSP, along with the necessary companion documents, has been designed to provide the regulatory agencies with sufficient detail to reach a determination as to the adequacy of the scope of work. The program has also been designed to provide the level of defensible data and information required to determine the nature and extent of residual chemical contamination in site media.

Table 3-1

Summary of Data Quality Objectives
Site Investigation
CWM Sites, Parcels 509(7), 183(6), 511(7), 512(7), 513(7), 516(7), 182(7), 180(7), 514(7), 517(7), and 188(7)
Fort McClellan, Calhoun County, Alabama

Potential Data Users	Available Data	Conceptual Site Model	Media of Concern	Data Uses and Objectives	Data Types	Analytical Level	Data Quantity
EPA, ADEM USACE, DOD FTMC, IT Corporation Other contractors, and possible future land users	Limited SI and RI data for a few sites	Contaminant Source CWM Sites Migration Pathways Infiltration to subsurface soil, infiltration and leaching to groundwater, biotransfer to deer, dust emissions and volatilization to ambient air, and runoff and erosion to surface water and sediment Potential Receptors Groundskeepers (current and future) construction workers (future), residents (future), and recreational site user (future) PSSC Decontamination solutions, volatiles, semivolatiles, metals	Surface soil Subsurface Soil Groundwater Surface Water Sediment	RI to confirm the nature and extent of contamination in the site media Definitive quality data for future decision-making	Surface soil TCL VOCs, TCL SVOCs, TAL Metals CWM Break Down Products	Definitive data in CESAS Level B data packages	43 direct-push soil samples + QC
					Subsurface Soil TCL VOCs, TCL SVOCs, TAL Metals CWM Break Down Products	Definitive data in CESAS Level B data packages	43 direct-push soil samples + QC
					Groundwater TCL VOCs, TCL SVOCs, TAL Metals CWM Break Down Products	Definitive data in CESAS Level B data packages	41 groundwater samples + QC
					Surface Water TCL VOCs, TCL SVOCs, TAL Metals CWM Break Down Products	Definitive data in CESAS Level B data packages	17 surface water samples + QC
					Sediment TCL VOCs, TCL SVOCs, TAL Metals, CWM Break Down Products TOC, and Grain Size	Definitive data in CESAS Level B data packages	17 sediment samples + QC

ADEM - Alabama Department of Environmental Management.
CESAS - Corps of Engineers South Atlantic Savannah.
DOD - U.S. Department of Defense.
EPA - U.S. Environmental Protection Agency.
FTMC - Fort McClellan.
PSSC - Potential site-specific chemicals.
QC - Quality control.
SI - Site inspection.
SVOC - Semivolatile organic compound.
TAL - Target analyte list.
TCL - Target Compound list.
TOC - Total organic carbon.
USACE - U.S. Army Corps of Engineers.
CWM - Chemical warfare material
VOC - Volatile organic compound.

3.3 Conceptual Site Exposure Model

The conceptual site exposure model (CSEM) provides the basis for identifying and evaluating potential risks to human health in the risk assessment. The CSEM includes receptors and potential exposure pathways appropriate to all plausible scenarios. The CSEM facilitates consistent and comprehensive evaluation of risk to human health through graphically presenting all possible exposure pathways, including sources, release and transport pathways, and exposure routes. In addition, the CSEM helps to ensure that potential pathways are not overlooked. The elements of a complete exposure pathway and CSEM are:

- Source (i.e., contaminated environmental) media
- Contaminant release mechanisms
- Contaminant transport pathways
- Receptors
- Exposure pathways.

Contaminant release mechanisms and transport pathways are not relevant for direct receptor contact scenarios with a contaminated source medium.

Primary contaminant releases were probably limited to leaks and spills that entered surface soil. Potential contaminant transport pathways include infiltration to subsurface soil, infiltration and leaching to groundwater, biotransfer to deer through browsing, dust emissions and volatilization to ambient air, and surface water runoff and erosion to surface water and sediment.

The FTMC comprehensive reuse plan (FTMC, 1997) has defined the intended future land uses of the CWM sites as follows:

- Agent ID Area – Industrial/Commercial
- Training Area T-6, - Open space, Remediation reserve
- Blacktop Training Area and Fenced Yard in Blacktop Area - Training/Education Campus
- Dog Training Area and Dog Kennel Area - Open space, Remediation reserve
- Training Area T-5 - Open space, Remediation reserve
- Former Detection and Identification Area – Training/Education campus

- Old Burn Pit - Training/Education campus
- CBR Proficiency Area - Training/Education campus
- Old Toxic Training Area – Training/Education campus.

Also, some of the CWM sites may not be deemed safe for public access until remediation has been completed because of the potential for UXO (USACE, 1999b). Plausible human health receptor scenarios addressed in the CSEM include:

- The resident scenario, although unlikely, is considered for future purposes only, because there are not any residents present at the sites and the likely future use is unclear.
- The groundskeeper scenario is considered for both current and future purposes, as some of the sites are currently maintained, and will probably be maintained in the future.
- The construction worker scenario is considered for future purposes only. The sites are currently not under construction, but will likely undergo construction in preparing for, or during future use(s) under the anticipated educational, industrial or commercial site usage.
- The recreational site user scenario is considered for future purposes because some of the sites contain open areas, however, the reuse is unclear. Venison is a possible future exposure medium for the recreational site user.

Human health receptor scenarios excluded from the CSEM include:

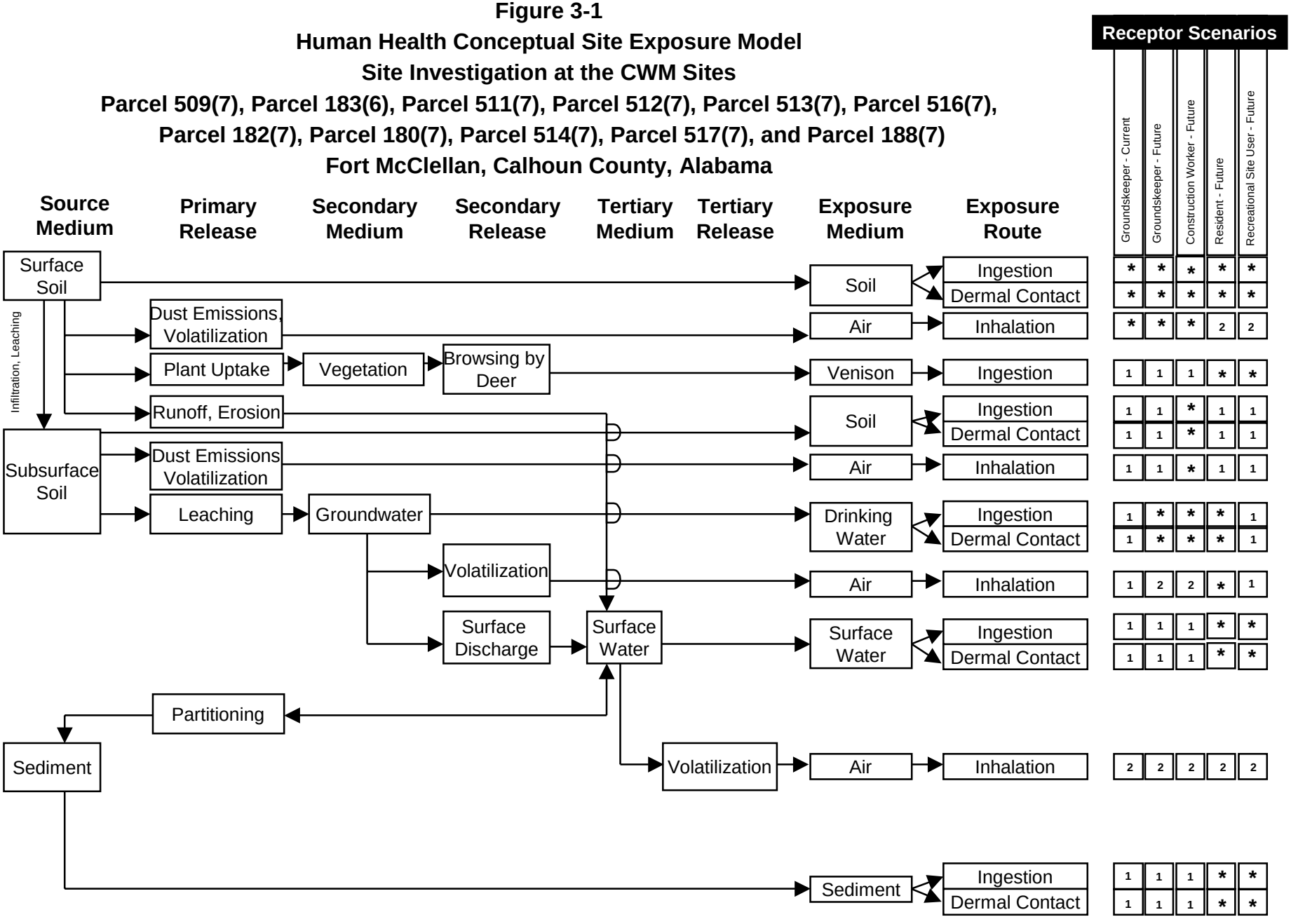
- Fish consumption is not considered for the recreational site user receptor scenario because there is not sufficient surface water on the site to support fishing activities.

A summary of relevant contaminant release and transport mechanisms, source and exposure media, and receptors and exposure pathways for this site is provided in Table 3-1 and Figure 3-1.

3.4 Decision-Making Process, Data Uses, and Needs

The decision-making process consists of a seven-step process that is presented in detail in Section 4.3 of the WP and will be followed during the SI at the CWM sites, Parcels 509(7), 183(6), 511(7), 512(7), 513(7), 516(7), 182(7), 180(7), 514(7), 517(7), and 188(7). Data uses and needs are summarized in Table 3-1.

Figure 3-1
Human Health Conceptual Site Exposure Model
Site Investigation at the CWM Sites
Parcel 509(7), Parcel 183(6), Parcel 511(7), Parcel 512(7), Parcel 513(7), Parcel 516(7), Parcel 182(7), Parcel 180(7), Parcel 514(7), Parcel 517(7), and Parcel 188(7)
Fort McClellan, Calhoun County, Alabama



* = Complete exposure pathway evaluated in the streamlined risk assessment.
1 = Incomplete exposure pathway.
2 = Although theoretically complete, this pathway is judged to be insignificant and is not evaluated in the streamlined risk assessment.

KN\4040\CWMRI\FIG3-1~1\10-10-00\12:00PM

3.4.1 Risk Evaluation

Confirmation of contamination at the CWM sites, Parcels 509(7), 183(6), 511(7), 512(7), 513(7), 516(7), 182(7), 180(7), 514(7), 517(7), and 188(7), will be based on comparing detected site chemicals to site-specific screening levels developed in the *Final Human Health and Ecological Screening Values and PAH Background Summary Report* (IT, 2000b). EPA definitive data with CESAS Level B data packages will be used to determine whether or not PSSCs are detected in site media. Definitive data will be adequate for confirming the nature and extent of site contamination and for supporting any required corrective measures, feasibility studies, and risk assessment.

Assessment of potential ecological risk associated with sites or parcels (e.g., surface water and sediment sampling, specific ecological assessment methods, etc.) will be addressed in accordance with the procedures in the WP.

3.4.2 Data Types and Quality

Surface soil, subsurface soil, groundwater, surface water, and sediment will be sampled and analyzed to meet the objectives of the RI at the CWM sites. Quality assurance/quality control (QA/QC) samples will be collected for all sample types as described in Chapter 4.0 of this SFSP. Samples will be analyzed by EPA-approved SW-846 Methods Update III, where available; comply with EPA definitive data requirements; and be reported using hard copy data packages along with electronic copies. In addition to meeting the quality needs of this SI, data analyzed at this level of quality are appropriate for all phases of the remedial investigation, feasibility study, and risk assessment.

3.4.3 Precision, Accuracy, and Completeness

Laboratory requirements of precision, accuracy, and completeness for this SI are provided in Section 9.0 of the QAP.

4.0 Field Activities

4.1 UXO and Chemical Warfare Agent Survey Requirements

A USACE-Huntsville requirement for conducting work at the CWM sites at FTMC is to use UXO anomaly avoidance techniques; therefore, UXO surface sweeps and downhole surveys of soil borings will be required to support field activities at the CWM sites. The surface sweeps and downhole surveys will be conducted to identify anomalies for the purpose of UXO avoidance.

The site-specific UXO safety plan provides technical guidance for ordnance and explosives avoidance and construction activities for sample collection activities at the CWM sites. The site-specific UXO safety plan attachment has been written in conjunction with Appendix E of the SAP (IT, 2000a).

The CWM sites are being investigated for chemical agents in soil by the USACE-Huntsville and Parsons. When the USACE investigates these sites, they will use real-time analysis methods to screen the soil for the presence of chemical agents. If agents are not present, additional air monitoring surveys will not be required in these areas when IT collects the planned soil samples and installs the monitoring wells. If potential hazardous, toxic, and radiologic waste sources are identified by Parsons, additional soil and groundwater samples may be collected. These additional samples will be tracked through project variance reports and presented in the SI report.

4.1.1 Surface UXO Survey

A UXO sweep will be conducted over areas that will be included in the sampling and surveying activities to identify UXO on or near the surface that may present a hazard to on-site workers during field activities. Low-sensitivity magnetometers will be used to locate surface and shallow-buried metal objects. UXO located on the surface will be identified and conspicuously marked for each avoidance. Subsurface metallic anomalies will not be disturbed, and will also be marked for easy avoidance. UXO personnel requirements, procedures, and detailed descriptions of the geophysical equipment to be used are provided in the site-specific UXO safety plan and Chapter 4.0 and Appendix E of the approved SAP (IT, 2000a).

4.1.2 Downhole UXO Survey

During the soil boring and downhole sampling, downhole UXO surveys will be performed to determine if buried metallic objects are present. UXO monitoring, as described in Chapter 4.0 of

the SAP (IT, 2000a), will continue until undisturbed soils are encountered or the borehole has been advanced to 12 feet bgs, whichever is reached first.

4.2 Utility Clearances

After the UXO surface survey has cleared the area to be sampled and prior to performing any intrusive sampling, a utility clearance will be performed at locations where soil and groundwater samples will be collected, using the procedure outlined in Section 4.2.6 of the SAP (IT, 2000a). The site manager will mark the proposed locations with stakes, coordinate with the FTMC installation and utility companies to clear the proposed locations for utilities, and obtain digging permits. Once the locations are approved (for both UXO and utility avoidance) for intrusive sampling, the stakes will be labeled as cleared.

4.3 Environmental Sampling

The environmental sampling program addressed by this SI at the CWM sites, Parcels 509(7), 183(6), 511(7), 512(7), 513(7), 516(7), 182(7), 180(7), 514(7), 517(7), and 188(7) includes the collection of surface soil, subsurface soil, groundwater, surface water, and sediment samples for chemical analyses. These samples will be collected and analyzed to provide data for characterizing the site to determine the environmental condition of the site and any further action to be conducted at the site.

4.3.1 Surface Soil Sampling

Surface soil samples will be collected from 43 soil locations at the CWM sites.

4.3.1.1 Sample Locations and Rationale

The surface soil sampling rationale are listed in Table 4-1. Proposed sampling locations are shown in Figures 4-1 through 4-9. Surface soil sample designations and required QA/QC sample requirements are summarized in Tables 4-2 through 4-10. The final soil boring sampling locations will be determined in the field by the on-site geologist, based on actual field conditions.

4.3.1.2 Sample Collection

Surface soil samples will be collected from the upper 1 foot of soil by direct-push methodology as specified in Section 4.7.1.1 of the SAP (IT, 2000a). Collected soil samples will be screened using a photoionization detector (PID) in accordance with Section 4.15 of the SAP. Surface soil samples will be screened for information purposes only, and not to select samples for analysis.

Table 4-1

Sampling Locations and Rationale
SI at CWM Sites
Parcel 509(7), 183(6), 511(7), 512(7), 513(7), 516(7), 182(7), 180(7), 514(7), 517(7) and 188(7)
Fort McClellan, Calhoun County, Alabama

Parcel Number	Sample Location	Sample Media	Sample Location Rationale
509	CWM-509-MW01	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface soil, subsurface soil, and groundwater samples to be placed on the southwest area of Parcel 509(7). Sample data will indicate if contaminant releases into the environment have occurred upgradient of this area and if contaminated soil exists at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer.
	CWM-509-MW02	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface soil, subsurface soil, and groundwater samples to be placed on the center area of Parcel 509(7). Sample data will indicate if contaminant releases into the environment have occurred upgradient of this area and if contaminated soil exists at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer.
	CWM-509-MW03	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface soil, subsurface soil, and groundwater samples to be placed in the northwest area of Parcel 509(7). Sample data will indicate if contaminant releases into the environment have occurred in this area and if contaminated soil exists at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer.
	CWM-509-MW04	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface soil, subsurface soil, and groundwater samples to be placed in the northeast area and downgradient of most of Parcel 509(7). Sample data will indicate if contaminant releases into the environment have occurred in this area and if contaminated soil exists at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer.
183	CWM-183-GP01	Surface soil and subsurface soil	Soil boring for surface and subsurface soil samples to be placed on the southeast side of the concrete pad identified by SAIC, 1993 in the south end of the site. Sample data will indicate if contaminant releases into the environment have occurred from use of this area and if contaminated soil exists at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
	CWM-183-GP02	Surface soil and subsurface soil	Soil boring for surface and subsurface soil samples to be placed east and adjacent to the historical location of armored personnel carriers (APC) used as training aids identified by SAIC, 1993 at the north end of the site . Sample data will indicate if contaminant releases into the environment have occurred from use of this area and if contaminated soil exists at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat
	CWM-183-MW01	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface soil, subsurface soil, and groundwater samples to be placed in the southwest area and upgradient of most of Parcel 183(6). Sample data will indicate if contaminant releases into the environment have occurred in this area and if contaminated soil exists at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer.
	CWM-183-MW02	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface soil, subsurface soil, and groundwater samples to be placed east and downgradient of the concrete pad in the south end of the site. Sample data will indicate if contaminant releases into the environment have occurred in this area and if contaminated soil exists at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer.
	CWM-183-MW03	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface soil, subsurface soil, and groundwater samples to be placed near the north boundary, downgradient of the northern section of the site. Sample data will indicate if contaminant releases into the environment have occurred in this area and if contaminated soil exists at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer.
	CWM-183-MW04	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface soil, subsurface soil, and groundwater samples to be placed east and downgradient of the location of the concrete pads identified by SAIC, 1993, near the north center of the site. Sample data will indicate if contaminant releases into the environment have occurred in this area and if contaminated soil exists at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer.
	CWM-183-MW05	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface soil, subsurface soil, and groundwater samples to be placed near the eastern boundary of the parcel and downgradient of the center area of the site. Sample data will indicate if contaminant releases into the environment have occurred in this area and if contaminated soil exists at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer.

Table 4-1

Sampling Locations and Rationale
SI at CWM Sites
Parcel 509(7), 183(6), 511(7), 512(7), 513(7), 516(7), 182(7), 180(7), 514(7), 517(7) and 188(7)
Fort McClellan, Calhoun County, Alabama

Parcel Number	Sample Location	Sample Media	Sample Location Rationale
183	CWM-183-MW06	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface soil, subsurface soil, and groundwater samples to be placed north and downgradient of the location of the concrete pads identified by SAIC, 1993, near the center of the site. Sample data will indicate if contaminant releases into the environment have occurred in this area and if contaminated soil exists at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer.
	CWM-183-MW07	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface soil, subsurface soil, and groundwater samples to be placed east and downgradient of the historical location of the APCs identified by SAIC, 1993 near the center of the site. Sample data will indicate if contaminant releases into the environment have occurred in this area and if contaminated soil exists at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer.
	CWM-183-MW08	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface soil, subsurface soil, and groundwater samples to be placed north and downgradient of the historical location of the APCs identified by SAIC, 1993, near the north-central area of the site. Sample data will indicate if contaminant releases into the environment have occurred in this area and if contaminated soil exists at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum
	CWM-183-SW/SD01	Surface water and sediment	Sample location is the South Branch of Cane Creek, east of the parcel. Sample data will indicate if contaminant releases have occurred from runoff from upstream of the parcel. Sample data will also be used to assess potential impacts to aquatic biota in the stream and other ecological receptors that may utilize that stream for food and/or habitat purposes.
	CWM-183-SW/SD02	Surface water and sediment	Sample location is the South Branch of Cane Creek, northeast of the parcel. Sample data will indicate if contaminant releases have occurred from runoff from the parcel. Sample data will also be used to assess potential impacts to aquatic biota in the stream and other ecological receptors that may utilize that stream for food and/or habitat purposes.
	CWM-183-SW/SD03	Surface water and sediment	Sample location is the intermittent stream in the northeast corner of the parcel. Sample data will indicate if contaminant releases have occurred from runoff from the parcel. Sample data will also be used to assess potential impacts to aquatic biota in the stream and other ecological receptors that may utilize that stream for food and/or habitat purposes.
511	CWM-511-MW01	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface soil, subsurface soil, and groundwater samples to be placed in the southern center section of the site, downgradient and north of the southern bleachers and possible demonstration area. Sample data will indicate if contaminant releases into the environment have occurred in this area and if contaminated soil exists at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum
	CWM-511-MW02	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface soil, subsurface soil, and groundwater samples to be placed in the center area of the site, northeast of the Fenced Yard. Sample data will indicate if contaminant releases into the environment have occurred in this area and the Fenced Yard and if contaminated soil exists at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer.
	CWM-511-MW03	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface soil, subsurface soil, and groundwater samples to be placed in the northeast area of the Parcel 511(7), northeast of the bleaachers and the possible demonstration area. Sample data will indicate if contaminant releases into the environment have occurred in this area and if contaminated soil exists at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer.
	CWM-511-SW/SD01	Surface water and sediment	Sample location is southwest of the Parcel 511(7) in the intermittent stream that flows north along the western edge of the parcel. Sample data will indicate if contaminant releases have occurred from runoff from upstream of the parcel. Sample data will also be used to assess potential impacts to aquatic biota in the stream and other ecological receptors that may utilize that stream for food and/or habitat purposes.
	CWM-511-SW/SD02	Surface water and sediment	Sample location is at the western edge of the Parcel 511(7) in the intermittent stream that flows north along the western edge of the parcel. Sample data will indicate if contaminant releases have occurred from runoff from activities conducted at the parcel. Sample data will also be used to assess potential impacts to aquatic biota in the stream and other ecological receptors that may utilize that stream for food and/or habitat purposes.
	CWM-511-SW/SD03	Surface water and sediment	Sample location is at the northeast of Parcel 511(7) in the intermittent stream that flows north away from the parcel. Sample data will indicate if contaminant releases have occurred from runoff from activities conducted at the parcel. Sample data will also be used to assess potential impacts to aquatic biota in the stream and other ecological receptors that may utilize that stream for food and/or habitat purposes.

Table 4-1

Sampling Locations and Rationale
SI at CWM Sites
Parcel 509(7), 183(6), 511(7), 512(7), 513(7), 516(7), 182(7), 180(7), 514(7), 517(7) and 188(7)
Fort McClellan, Calhoun County, Alabama

Parcel Number	Sample Location	Sample Media	Sample Location Rationale
512	CWM-512-MW01	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface soil, subsurface soil, and groundwater samples to be placed in the northern center area of the former Fenced Yard, Parcel 512(7). Sample data will indicate if contaminant releases into the environment have occurred in the Fenced Yard and if contaminated soil exists at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer.
513	CWM-513-MW01	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface soil, subsurface soil, and groundwater samples to be placed east of the concrete pads in the Dog Training Area. Sample data will indicate if contaminant releases into the environment have occurred in this area and if contaminated soil exists at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer.
	CWM-513-MW02	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface soil, subsurface soil, and groundwater samples to be placed in the northeast area and downgradient of the Dog Training Area. Sample data will indicate if contaminant releases into the environment have occurred in this area and if contaminated soil exists at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer.
	CWM-513-SW/SD01	Surface water and sediment	Sample location is northeast of Parcel 513(7) in the intermittent stream that flows outside the eastern boundary of the parcel. Sample data will indicate if contaminant releases have occurred from runoff from former activities at the parcel. Sample data will also be used to assess potential impacts to aquatic biota in the stream and other ecological receptors that may utilize that stream for food and/or habitat purposes.
	CWM-513-SW/SD02	Surface water and sediment	Sample location is east of Parcel 513(7) in the intermittent stream that flows outside the eastern boundary of the parcel. Sample data will indicate if contaminant releases have occurred from runoff from former activities at the parcel. Sample data will also be used to assess potential impacts to aquatic biota in the stream and other ecological receptors that may utilize that stream for food and/or habitat purposes.
516	CWM-516-MW01	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface soil, subsurface soil, and groundwater samples to be placed northeast of and downgradient of the Dog Kennel Area, Parcel 516(7). Sample data will indicate if contaminant releases into the environment have occurred in this area and if contaminated soil exists at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer.
	CWM-516-MW02	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface soil, subsurface soil, and groundwater samples to be placed in the center area of the Dog Kennel Area, Parcel 516(7). Sample data will indicate if contaminant releases into the environment have occurred in this area and if contaminated soil exists at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer.
182	CWM-182-MW01	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface soil, subsurface soil, and groundwater samples to be placed near the western boundary in the southwest section of the site. Sample data will indicate if contaminant releases into the environment have occurred from upgradient of the parcel and if contaminated soil exists at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer.
	CWM-182-MW02	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface soil, subsurface soil, and groundwater samples to be placed in the southeast area of the site. Sample data will indicate if contaminant releases into the environment have occurred in the southern area of the parcel and if contaminated soil exists at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer.
	CWM-182-MW03	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface soil, subsurface soil, and groundwater samples to be placed in the eastern central area of the site. Sample data will indicate if contaminant releases into the environment have occurred in the central area of the parcel and if contaminated soil exists at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer.
	CWM-182-MW04	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface soil, subsurface soil, and groundwater samples to be placed in the central area of the site. Sample data will indicate if contaminant releases into the environment have occurred in the central area of the parcel and if contaminated soil exists at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer.
	CWM-182-MW05	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well location for surface soil, subsurface soil, and groundwater samples to be placed in the northeast area of the site. Sample data will indicate if contaminant releases into the environment have occurred in the northern area of the parcel and if contaminated soil exists at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer.
182	CWM-182-MW06	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface soil, subsurface soil, and groundwater samples to be placed in the northwest area of the site. Sample data will indicate if contaminant releases into the environment have occurred in the northern area of the parcel and if contaminated soil exists at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer.

Table 4-1

Sampling Locations and Rationale
SI at CWM Sites
Parcel 509(7), 183(6), 511(7), 512(7), 513(7), 516(7), 182(7), 180(7), 514(7), 517(7) and 188(7)
Fort McClellan, Calhoun County, Alabama

Parcel Number	Sample Location	Sample Media	Sample Location Rationale
	CWM-182-SW/SD01	Surface water and sediment	Sample location is east of the site in the intermittent stream that flows along the eastern boundary of the parcel. Sample data will indicate if contaminant releases have occurred from runoff from former activities at the parcel. Sample data will also be used to assess potential impacts to aquatic biota in the stream and other ecological receptors that may utilize that stream for food and/or habitat purposes.
	CWM-182-SW/SD02	Surface water and sediment	Sample location is south of the site in the intermittent stream that flows north toward the southern boundary of the parcel. Sample data will indicate if contaminant releases have occurred from runoff from upgradient of the parcel. Sample data will also be used to assess potential impacts to aquatic biota in the stream and other ecological receptors that may utilize that stream for food and/or habitat purposes.
	CWM-182-SW/SD03	Surface water and sediment	Sample location is north of parcel in the intermittent stream that flows along the northwest boundary of the parcel and away from the site. Sample data will indicate if contaminant releases have occurred from runoff from former activities in northernn section of the parcel. Sample data will also be used to assess potential impacts to aquatic biota in the stream and other ecological receptors that may utilize that stream for food and/or habitat purposes.
	CWM-182-SW/SD04	Surface water and sediment	Sample location is northwest of the parcel in the intermittent stream that flows easterly across the northwest corner of the parcel . Sample data will indicate if contaminant releases have occurred from runoff from upstream of the parcel. Sample data will also be used to assess potential impacts to aquatic biota in the stream and other ecological receptors that may utilize that stream for food and/or habitat purposes.
	CWM-182-SW/SD05	Surface water and sediment	Sample location is west of the parcel in the intermittent stream that flows northeasterly into the northwest corner of the parcel . Sample data will indicate if contaminant releases have occurred from runoff from upstream of the parcel. Sample data will also be used to assess potential impacts to aquatic biota in the stream and other ecological receptors that may utilize that stream for food and/or habitat purposes.
	CWM-182-SW/SD06	Surface water and sediment	Sample location is in the northwest section of the parcel in the intermittent stream that flows easterly across the northwest corner of the parcel . Sample data will indicate if contaminant releases have occurred from former activities conducted at the parcel. Sample data will also be used to assess potential impacts to aquatic biota in the stream and other ecological receptors that may utilize that stream for food and/or habitat purposes.
180	CWM-180-MW01	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface soil, subsurface soil and groundwater samples to be placed near the southwest corner of the site. Sample data will indicate if contaminate releases into the environment have occurred from upgradient of the parcel and if contaminate soil exists at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes. The monitoring well will provide information on groundwater flow direction and groundwater quality in the residuum aquifer.
	CWM-180-MW02	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface soil, subsurface soil and groundwater samples to be placed near the eastern boundary of the southern section of the site. Sample data will indicate if contaminate releases into the environment have occurred in the southern section of the parcel and if contaminate soil exists at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes. The monitoring well will provide information on groundwater flow direction and groundwater quality in the residuum aquifer.
	CWM-180-MW03	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface soil, subsurface soil and groundwater samples to be placed downgradient of the burn pit identified by the concrete monument "F". Sample data will indicate if contaminate releases into the environment have occurred in the burn pit and the central section of the parcel and if contaminate soil exists at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes. The monitoring well will provide information on groundwater flow direction and groundwater quality in the residuum aquifer.
	CWM-180-MW04	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface soil, subsurface soil and groundwater samples to be placed near the northeastern boundary of the northern section of the site. Sample data will indicate if contaminate releases into the environment have occurred in the northern section of the parcel and if contaminate soil exists at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes. The monitoring well will provide information on groundwater flow direction and groundwater quality in the residuum aquifer.
514	CWM-514-MW01	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface soil, subsurface soil and groundwater samples to be placed at the southwest corner of the site. Sample data will indicate if contaminate releases into the environment have occurred from upgradient of the parcel and if contaminate soil exists at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes. The monitoring well will provide information on groundwater flow direction and groundwater quality in the residuum aquifer.
	CWM-514-MW02	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface soil, subsurface soil and groundwater samples to be placed northeast and downgradient of the circular pit location. Sample data will indicate if contaminate releases into the environment have occurred from the burn pit and if contaminate soil exists at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes. The monitoring well will provide information on groundwater flow direction and groundwater quality in the residuum aquifer.
514	CWM-514-MW03	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface soil, subsurface soil and groundwater samples to be placed in the northeastern area of the site. Sample data will indicate if contaminate releases into the environment have occurred in the northern section of the parcel and if contaminate soil exists at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes. The monitoring well will provide information on groundwater flow direction and groundwater quality in the residuum aquifer.
517	CWM-517-MW01	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface soil, subsurface soil and groundwater samples to be placed near the western boundary of the center of the site. Sample data will indicate if contaminate releases into the environment have occurred from upgradient of the parcel and if contaminate soil exists at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes. The monitoring well will provide information on groundwater flow direction and groundwater quality in the residuum aquifer.

Table 4-1

Sampling Locations and Rationale
SI at CWM Sites
Parcel 509(7), 183(6), 511(7), 512(7), 513(7), 516(7), 182(7), 180(7), 514(7), 517(7) and 188(7)
Fort McClellan, Calhoun County, Alabama

Parcel Number	Sample Location	Sample Media	Sample Location Rationale
	CWM-517-MW02	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface soil, subsurface soil and groundwater samples to be placed in the southeastern section of the site. Sample data will indicate if contaminate releases into the environment have occurred in the southern area of the parcel and if contaminate soil exists at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes. The monitoring well will provide information on groundwater flow direction and groundwater quality in the residuum aquifer.
	CWM-517-MW03	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface soil, subsurface soil and groundwater samples to be placed near the eastern boundary in the central area of the site. Sample data will indicate if contaminate releases into the environment have occurred in the southern area of the parcel and if contaminate soil exists at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes. The monitoring well will provide information on groundwater flow direction and groundwater quality in the residuum aquifer.
	CWM-517-MW04	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface soil, subsurface soil and groundwater samples to be placed near the eastern boundary in the northern area of the site. Sample data will indicate if contaminate releases into the environment have occurred in the northern area of the parcel and if contaminate soil exists at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes. The monitoring well will provide information on groundwater flow direction and groundwater quality in the residuum aquifer.
	CWM-517-SW/SD01	Surface water and sediment	Sample location is along the southern boundary of the site in the intermittent man-made surface drainage that flows easterly toward the southeastern corner of the parcel. Sample data will indicate if contaminant releases have occurred from runoff from former activities at the parcel. Sample data will also be used to assess potential impacts to aquatic biota in the stream and other ecological receptors that may utilize that stream for food and/or habitat purposes.
	CWM-517-SW/SD02	Surface water and sediment	Sample location is along the eastern boundary of the site in the intermittent man-made surface drainage that flows northerly along the eastern border of the parcel. Sample data will indicate if contaminant releases have occurred from runoff from former activities at the parcel. Sample data will also be used to assess potential impacts to aquatic biota in the stream and other ecological receptors that may utilize that stream for food and/or habitat purposes.
	CWM-517-SW/SD03	Surface water and sediment	Sample location is northeast of the site in the intermittent man-made surface drainage that flows northerly away from the parcel. Sample data will indicate if contaminant releases have occurred from runoff from former activities at the parcel. Sample data will also be used to assess potential impacts to aquatic biota in the stream and other ecological receptors that may utilize that stream for food and/or habitat purposes.
188	CWM-188-MW01	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface soil, subsurface soil and groundwater samples to be placed near the north of the training area ditch identified by SAIC. Sample data will indicate if contaminate releases into the environment have occurred from the training area ditch identified by SAIC. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes. The monitoring well will provide information on groundwater flow direction and groundwater quality in the residuum aquifer.
	CWM-188-MW02	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface soil, subsurface soil and groundwater samples to be placed downgradient and north of the southern area of the site. Sample data will indicate if contaminate releases into the environment have occurred in the southern area of the parcel and if contaminate soil exists at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes. The monitoring well will provide information on groundwater flow direction and groundwater quality in the residuum aquifer.
	CWM-188-MW03	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface soil, subsurface soil and groundwater samples to be placed near the eastern boundary in the central area of the parcel. Sample data will indicate if contaminate releases into the environment have occurred in this area of the parcel and if contaminate soil exists at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes. The monitoring well will provide information on groundwater flow direction and groundwater quality in the residuum aquifer.
	CWM-188-MW04	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface soil, subsurface soil and groundwater samples to be placed near the eastern boundary at the northern end of the parcel. Sample data will indicate if contaminate releases into the environment have occurred in the northern area of the parcel and if contaminate soil exists at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes. The monitoring well will provide information on groundwater flow direction and groundwater quality in the residuum aquifer.

Table 4-2

Surface Soil and Subsurface Soil Sample Designations and QA/QC Sample Quantities
Agent ID Area, Parcel 509(7)
Site Investigation at CWM Sites
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	Sample Depth (ft)	QA/QC Samples			Analytical Suite
			Field Duplicates	Field Splits	MS/MSD	
CWM-509-MW01	CWM-509-MW01-SS-TN0001-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products
	CWM-509-MW01-DS-TN0002-REG	a			CWM-509-MW01-DS-TN0002-MS/MSD	
CWM-509-MW02	CWM-509-MW02-SS-TN0003-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products
	CWM-509-MW02-DS-TN0004-REG	a				
CWM-509-MW03	CWM-509-MW03-SS-TN0005-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products
	CWM-509-MW03-DS-TN0006-REG	a				
CWM-509-MW04	CWM-509-MW04-SS-TN0007-REG	0-1	CWM-509-MW04-SS-TN0008-FD	CWM-509-MW04-SS-TN0009-FS		TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products
	CWM-509-MW04-DS-TN0010-REG	a				

[a] Actual sample depth selected for analysis will be at the discretion of the site geologist and will be based on field observation.

CWM - Chemical Warfare Material
FD - Field duplicate.
FS - Field split.
ft - Foot
MS/MSD - Matrix spike/matrix spike duplicate.
QA/QC - Quality assurance/quality control.
REG - Field sample.
SVOC - Semivolatile organic compound.
TAL - Target analyte list.
TCL - Target compound list.
VOC - Volatile organic compound.

Table 4-3

Surface Soil and Subsurface Soil Sample Designations and QA/QC Sample Quantities
Training Area T-6, Parcel 183(6)
Site Investigation at CWM Sites
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	Sample Depth (ft)	QA/QC Samples			Analytical Suite
			Field Duplicates	Field Splits	MS/MSD	
CWM-183-GP01	CWM-183-GP01-SS-TG0001-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products
	CWM-183-GP01-DS-TG0002-REG	a				
CWM-183-GP02	CWM-183-GP02-SS-TG0003-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products
	CWM-183-GP02-DS-TG0004-REG	a				
CWM-183-MW01	CWM-183-MW01-SS-TG0005-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products
	CWM-183-MW01-DS-TG0006-REG	a			CWM-183-MW01-DS-TG0006-MS/MSD	
CWM-183-MW02	CWM-183-MW02-SS-TG0007-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products
	CWM-183-MW02-DS-TG0008-REG	a				
CWM-183-MW03	CWM-183-MW03-SS-TG0009-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products
	CWM-183-MW03-DS-TG0010-REG	a				
CWM-183-MW04	CWM-183-MW04-SS-TG0011-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products
	CWM-183-MW04-DS-TG0012-REG	a				
CWM-183-MW05	CWM-183-MW05-SS-TG0013-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products
	CWM-183-MW05-DS-TG0014-REG	a				
CWM-183-MW06	CWM-183-MW06-SS-TG0015-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products
	CWM-183-MW06-DS-TG0016-REG	a				
CWM-183-MW07	CWM-183-MW07-SS-TG0017-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products
	CWM-183-MW07-DS-TG0018-REG	a				
CWM-183-MW08	CWM-183-MW08-SS-TG0019-REG	0-1	CWM-183-MW08-SS-TG0020-FD	CWM-183-MW08-SS-TG0021-FS		TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products
	CWM-183-MW08-DS-TG0022-REG	a				

[a] Actual sample depth selected for analysis will be at the discretion of the site geologist and will be based on field observation.

CWM - Chemical Warfare Material
FD - Field duplicate.
FS - Field split.
ft - Foot
MS/MSD - Matrix spike/matrix spike duplicate.
QA/QC - Quality assurance/quality control.
REG - Field sample.
SVOC - Semivolatile organic compound.
TAL - Target analyte list.
TCL - Target compound list.
VOC - Volatile organic compound.

Table 4-4

Surface Soil and Subsurface Soil Sample Designations and QA/QC Sample Quantities
Blacktop Training Area and Fenced Yard, Parcels 511(7) and 512(7)
Site Investigation at CWM Sites
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	Sample Depth (ft)	QA/QC Samples			Analytical Suite
			Field Duplicates	Field Splits	MS/MSD	
CWM-511-MW01	CWM-511-MW01-SS-TP0001-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products
	CWM-511-MW01-DS-TP0002-REG	a				
CWM-511-MW02	CWM-511-MW02-SS-TP0003-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products
	CWM-511-MW02-DS-TP0004-REG	a				
CWM-511-MW03	CWM-511-MW03-SS-TP0005-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products
	CWM-511-MW03-DS-TP0006-REG	a				
CWM-512-MW01	CWM-512-MW01-SS-TPP0001-REG	0-1	CWM-512-MW01-SS-TPP0002-FD			TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products
	CWM-512-MW01-DS-TPP0003-REG	a				

[a] Actual sample depth selected for analysis will be at the discretion of the site geologist and will be based on field observation.

CWM - Chemical Warfare Material
FD - Field duplicate.
FS - Field split.
ft - Foot
MS/MSD - Matrix spike/matrix spike duplicate.
QA/QC - Quality assurance/quality control.
REG - Field sample.
SVOC - Semivolatile organic compound.
TAL - Target analyte list.
TCL - Target compound list.
VOC - Volatile organic compound.

Table 4-5

Surface Soil and Subsurface Soil Sample Designations and QA/QC Sample Quantities
Dog Training Area and Dog Kennel Area, Parcels 513(7) and 516(7)
Site Investigation at CWM Sites
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	Sample Depth (ft)	QA/QC Samples			Analytical Suite
			Field Duplicates	Field Splits	MS/MSD	
CWM-513-MW01	CWM-513-MW01-SS-TR0001-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products
	CWM-513-MW01-DS-TR0002-REG	a				
CWM-513-MW02	CWM-513-MW02-SS-TR0003-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products
	CWM-513-MW02-DS-TR0004-REG	a				
CWM-516-MW01	CWM-516-MW01-SS-TRR0001-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products
	CWM-516-MW01-DS-TRR0002-REG	a				
CWM-516-MW02	CWM-516-MW02-SS-TRR0003-REG	0-1	CWM-516-MW02-SS-TRR0004-FD	CWM-516-MW02-SS-TRR0005-FS		TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products
	CWM-516-MW02-DS-TRR0006-REG	a				

[a] Actual sample depth selected for analysis will be at the discretion of the site geologist and will be based on field observation.

CWM - Chemical Warfare Material.
FD - Field duplicate.
FS - Field split.
MS/MSD - Matrix spike/matrix spike duplicate.
QA/QC - Quality assurance/quality control.
REG - Field sample.
SVOC - Semivolatile organic compound.
TAL - Target analyte list.
TCL - Target compound list.
VOC - Volatile organic compound.

Table 4-6

Surface Soil and Subsurface Soil Sample Designations and QA/QC Sample Quantities
Training Area T-5, Parcel 182(7)
Site Investigation at CWM Sites,
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	Sample Depth (ft)	QA/QC Samples			Analytical Suite
			Field Duplicates	Field Splits	MS/MSD	
CWM-182-MW01	CWM-182-MW01-SS-TE0001-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products
	CWM-182-MW01-DS-TE0002-REG	a			CWM-182-MW01-DS-TE0002-MS/MSD	
CWM-182-MW02	CWM-182-MW02-SS-TE0003-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products
	CWM-182-MW02-DS-TE0004-REG	a				
CWM-182-MW03	CWM-182-MW03-SS-TE0005-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products
	CWM-182-MW03-DS-TE0006-REG	a				
CWM-182-MW04	CWM-182-MW04-SS-TE0007-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products
	CWM-182-MW04-DS-TE0008-REG	a				
CWM-182-MW05	CWM-182-MW05-SS-TE0009-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products
	CWM-182-MW05-DS-TE0010-REG	a				
CWM-182-MW06	CWM-182-MW06-SS-TE0011-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products
	CWM-182-MW06-DS-TE0012-REG	a	CWM-182-MW06-DS-TE0013-FD			

[a] Actual sample depth selected for analysis will be at the discretion of the site geologist and will be based on field observation.

CWM - Chemical Warfare Material
FD - Field duplicate.
ft - Foot
MS/MSD - Matrix spike/matrix spike duplicate.
QA/QC - Quality assurance/quality control.
REG - Field sample.
SVOC - Semivolatile organic compound.
TAL - Target analyte list.
TCL - Target compound list.
VOC - Volatile organic compound.

Table 4-7

Surface Soil and Subsurface Soil Sample Designations and QA/QC Sample Quantities
Former Detection and Identification Area, Parcel 180(7)
Site Investigation at CWM Sites
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	Sample Depth (ft)	QA/QC Samples			Analytical Suite
			Field Duplicates	Field Splits	MS/MSD	
CWM-180-MW01	CWM-180-MW01-SS-TK0001-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products
	CWM-180-MW01-DS-TK0002-REG	a				
CWM-180-MW02	CWM-180-MW02-SS-TK0003-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products
	CWM-180-MW02-DS-TK0004-REG	a				
CWM-180-MW03	CWM-180-MW03-SS-TK0005-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products
	CWM-180-MW03-DS-TK0006-REG	a				
CWM-180-MW04	CWM-180-MW04-SS-TK0007-REG	0-1	CWM-180-MW04-SS-TK0008-FD	CWM-180-MW04-SS-TK0009-FS		TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products
	CWM-180-MW04-DS-TK0010-REG	a				

[a] Actual sample depth selected for analysis will be at the discretion of the site geologist and will be based on field observation.

CWM - Chemical Warfare Material
FD - Field duplicate.
FS - Field split.
ft - Foot
MS/MSD - Matrix spike/matrix spike duplicate.
QA/QC - Quality assurance/quality control.
REG - Field sample.
SVOC - Semivolatile organic compound.
TAL - Target analyte list.
TCL - Target compound list.
VOC - Volatile organic compound.

Table 4-8

Surface Soil and Subsurface Soil Sample Designations and QA/QC Sample Quantities
Old Burn Pit, Parcel 514(7)
Site Investigation at CWM Sites
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	Sample Depth (ft)	QA/QC Samples			Analytical Suite
			Field Duplicates	Field Splits	MS/MSD	
CWM-514-MW01	CWM-514-MW01-SS-TT0001-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products
	CWM-514-MW01-DS-TT0002-REG	a				
CWM-514-MW02	CWM-514-MW02-SS-TT0003-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products
	CWM-514-MW02-DS-TT0004-REG	a				
CWM-514-MW03	CWM-514-MW03-SS-TT0005-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products
	CWM-514-MW03-DS-TT0006-REG	a	CWM-514-MW03-DS-TT0007-FD			

[a] Actual sample depth selected for analysis will be at the discretion of the site geologist and will be based on field observation.

CWM - Chemical Warfare Material
FD - Field duplicate.
ft - Foot.
MS/MSD - Matrix spike/matrix spike duplicate.
QA/QC - Quality assurance/quality control.
REG - Field sample.
SVOC - Semivolatile organic compound.
TAL - Target analyte list.
TCL - Target compound list.
VOC - Volatile organic compound.

Table 4-9

Surface Soil and Subsurface Soil Sample Designations and QA/QC Sample Quantities
CBR Proficiency Area, Parcel 517(7)
Site Investigation at CWM Sites
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	Sample Depth (ft)	QA/QC Samples			Analytical Suite
			Field Duplicates	Field Splits	MS/MSD	
CWM-517-MW01	CWM-517-MW01-SS-TV0001-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products
	CWM-517-MW01-DS-TV0002-REG	a			CWM-517-MW01-DS-TV0002-MS/MSD	
CWM-517-MW02	CWM-517-MW02-SS-TV0003-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products
	CWM-517-MW02-DS-TV0004-REG	a				
CWM-517-MW03	CWM-517-MW03-SS-TV0005-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products
	CWM-517-MW03-DS-TV0006-REG	a				
CWM-517-MW04	CWM-517-MW04-SS-TV0007-REG	0-1	CWM-517-MW04-SS-TV0008-FD			TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products
	CWM-517-MW04-DS-TV0009-REG	a				

[a] Actual sample depth selected for analysis will be at the discretion of the site geologist and will be based on field observation.

CWM - Chemical Warfare Material
FD - Field duplicate.
ft - Foot.
MS/MSD - Matrix spike/matrix spike duplicate.
QA/QC - Quality assurance/quality control.
REG - Field sample.
SVOC - Semivolatile organic compound.
TAL - Target analyte list.
TCL - Target compound list.
VOC - Volatile organic compound.

Table 4-10

Surface Soil and Subsurface Soil Sample Designations and QA/QC Sample Quantities
Old Toxic Training Area, Parcel 188(7)
Site Investigation at CWM Sites
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	Sample Depth (ft)	QA/QC Samples			Analytical Suite
			Field Duplicates	Field Splits	MS/MSD	
CWM-188-MW01	CWM-188-MW01-SS-TM0001-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products
	CWM-188-MW01-DS-TM0002-REG	a				
CWM-188-MW02	CWM-188-MW02-SS-TM0003-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products
	CWM-188-MW02-DS-TM0004-REG	a				
CWM-188-MW03	CWM-188-MW03-SS-TM0005-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products
	CWM-188-MW03-DS-TM0006-REG	a				
CWM-188-MW04	CWM-188-MW04-SS-TM0007-REG	0-1	CWM-188-MW04-SS-TM0008-FD			TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products
	CWM-188-MW04-DS-TM0009-REG	a				

[a] Actual sample depth selected for analysis will be at the discretion of the site geologist and will be based on field observation.

CWM - Chemical Warfare Material
FD - Field duplicate.
ft - Foot.
MS/MSD - Matrix spike/matrix spike duplicate.
QA/QC - Quality assurance/quality control.
REG - Field sample.
SVOC - Semivolatile organic compound.
TAL - Target analyte list.
TCL - Target compound list.
VOC - Volatile organic compound.

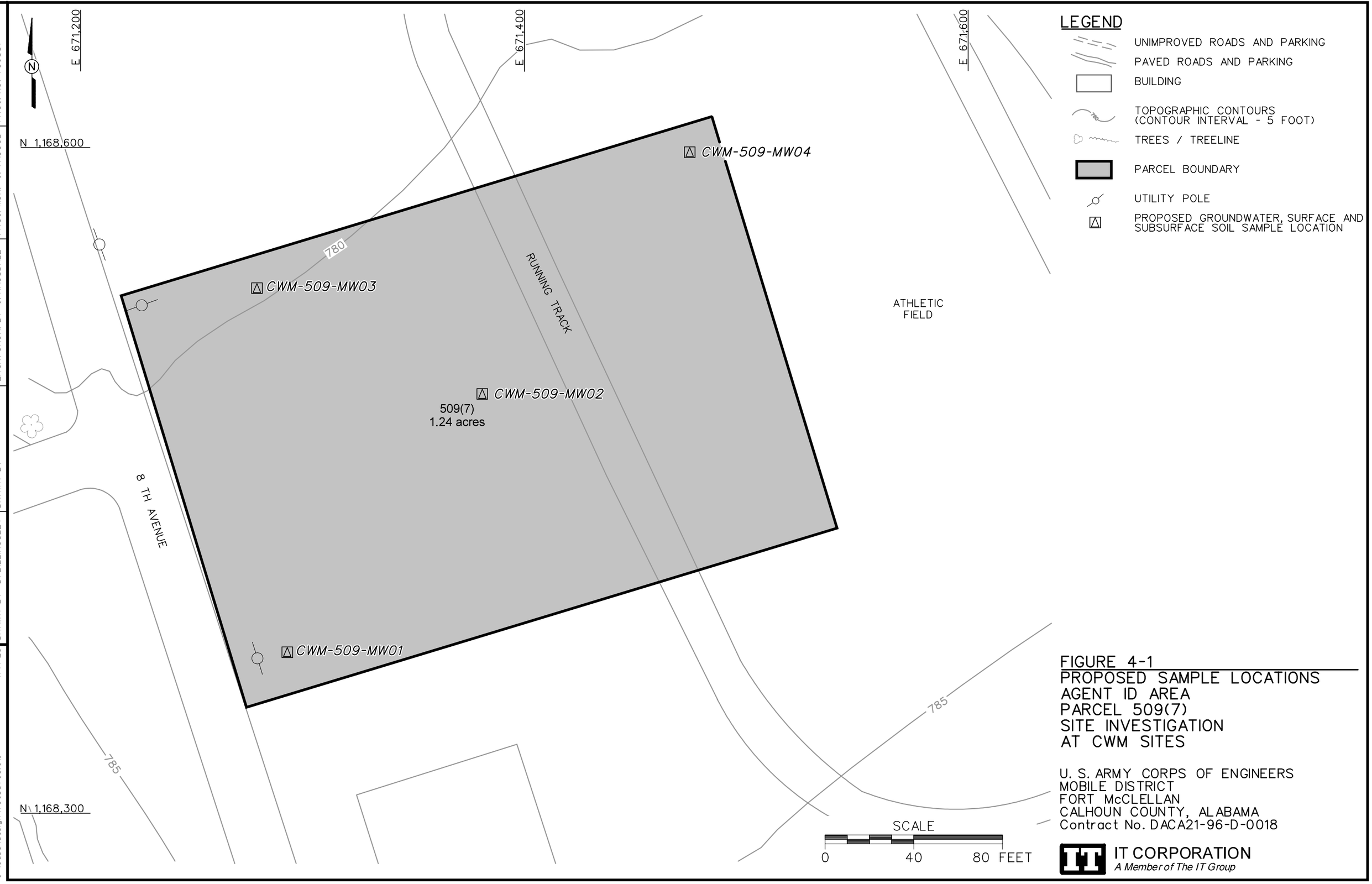


FIGURE 4-1
PROPOSED SAMPLE LOCATIONS
AGENT ID AREA
PARCEL 509(7)
SITE INVESTIGATION
AT CWM SITES

U. S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

IT CORPORATION
A Member of The IT Group

DRAFT. CHCK. BY:
ENGR. CHCK. BY: J. RAGSDALE
INITIATOR: J. RAGSDALE
PROJ. MGR.: J. YACOUB
DRAWN BY: D. BILLINGSLEY
STARTING DATE: 12/20/99
DRAWN BY:
DATE LAST REV.:
DWG. NO.: ...\796887es.016
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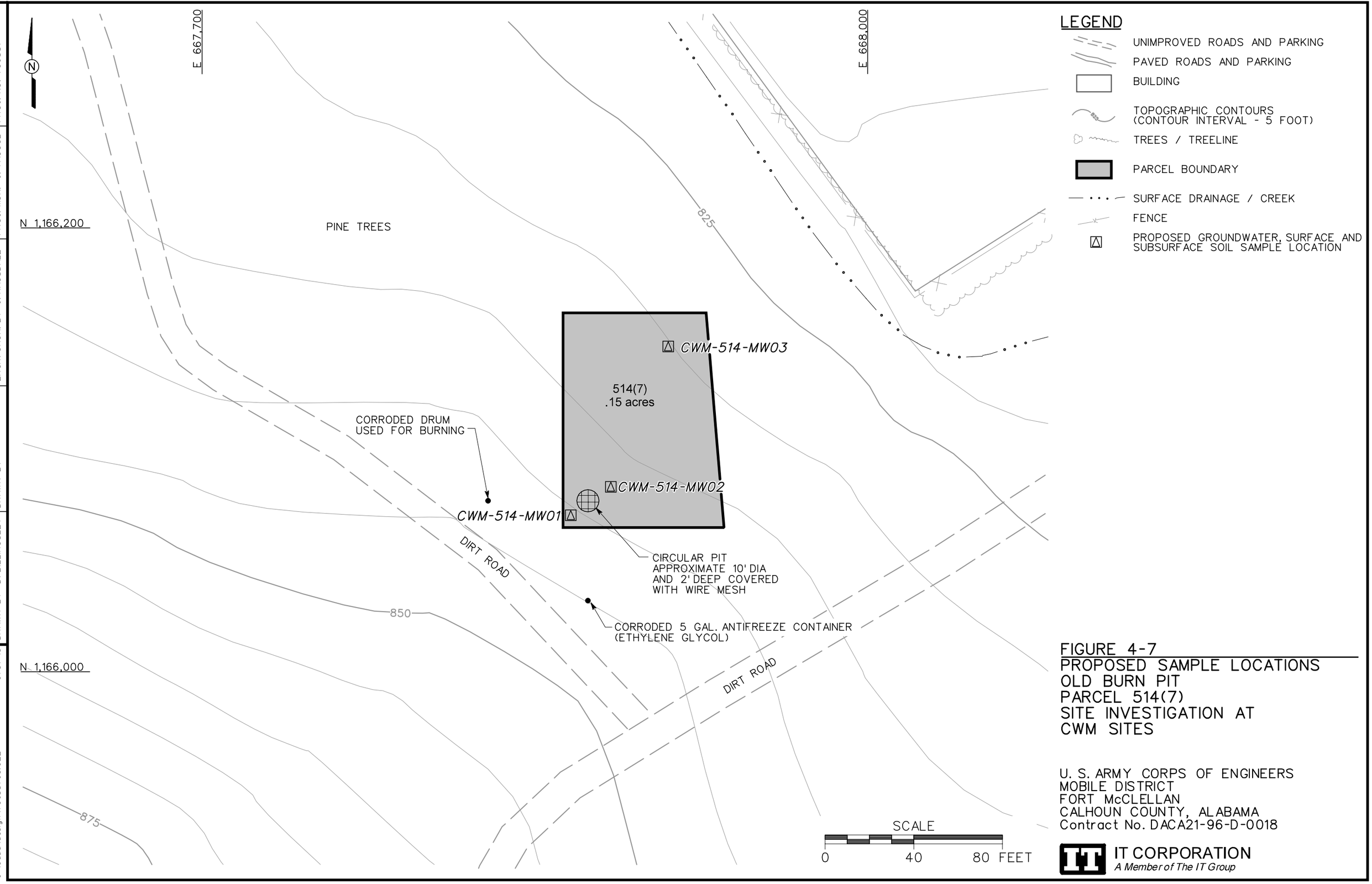

FIGURE 4-7
PROPOSED SAMPLE LOCATIONS
OLD BURN PIT
PARCEL 514(7)
SITE INVESTIGATION AT
CWM SITES

U. S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

IT CORPORATION
A Member of The IT Group

DRAFT. CHCK. BY:
ENGR. CHCK. BY: J. RAGSDALE
INITIATOR: J. RAGSDALE
PROJ. MGR.: J. YACOUB
DWG. NO.: ...\796887es.022
PROJ. NO.: 796887
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DATE LAST REV.:
DRAWN BY:
STARTING DATE: 12/20/99
DRAWN BY: D. BILLINGSLEY
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Sample containers, sample volumes, preservatives, and holding times for the analyses required in this SFSP are listed in Section 5.0, Table 5-1, of the QAP. Sample documentation and chain-of-custodies will be recorded as specified in Section 4.13 of the SAP. The samples will be analyzed for the parameters listed in Section 4.6 of this SFSP.

4.3.2 Subsurface Soil Sampling

Subsurface soil samples will be collected from the 43 soil borings installed at the 11 CWM sites.

4.3.2.1 Sample Locations and Rationale

Subsurface soil samples will be collected from the soil borings proposed on Figures 4-1 through 4-9. The subsurface soil sampling rationale is listed in Table 4-1. Subsurface soil samples to be collected are listed in Tables 4-2 through 4-10. The final soil boring sampling locations will be determined in the field by the on-site geologist, based on actual field observations and utility clearance results.

4.3.2.2 Sample Collection

Subsurface soil samples will be collected from soil borings at a depth greater than 1 foot bgs in the unsaturated zone. The soil borings will be advanced and soil samples collected using the direct-push sampling procedures specified in Section 4.7.1.1 of the SAP (IT, 2000a).

Soil samples will be collected continuously for the first 12 feet or until either groundwater or refusal is reached. A detailed lithogical log will be recorded by the on-site geologist for each borehole. At least one subsurface sample from each borehole will be selected for analyses. The collected subsurface soil samples will be field-screened using a PID in accordance with Section 4.15 of the SAP to measure samples exhibiting elevated readings exceeding background (readings in ambient air). Typically, the subsurface soil sample showing the highest reading (above background) will be selected and sent to the laboratory for analysis. If none of the samples indicate readings exceeding background using the PID, the deepest interval from the soil boring will be sampled and submitted to the laboratory for analyses. Subsurface soil samples will be selected for analyses from any depth interval if the on-site geologist suspects PSSCs at the interval. Site conditions such as lithology may also determine the actual sample depth interval submitted for analyses. More than one subsurface soil sample will be collected if field measurements and observations indicate a possible layer of PSSCs and/or additional sample data would provide insight to the existence of any PSSCs.

Sample documentation and chain of custody will be recorded as specified in Section 4.13 of the SAP. Sample containers, sample volumes, preservatives, and holding times for the analyses required in this SFSP are listed in Section 5.0, Table 5-1 of the QAP. The samples will be analyzed for the parameters listed in Section 4.6 of this SFSP.

4.3.3 Permanent Residuum Monitoring Wells

Forty-one permanent residuum monitoring wells will be installed at the CWM sites. The permanent residuum monitoring well locations are shown on Figures 4-1 through 4-9. The rationale for the monitoring well locations are presented in Table 4-1. The monitoring well boreholes will be drilled a minimum of 5 feet into the water bearing zone or to the top of bedrock, whichever is first, using a truck-mounted hollow-stem auger drill rig. Depth to bedrock is approximately 20 to 75 feet bgs at the sites. The monitoring well casing will consist of new 2-inch inside diameter, Schedule 40, threaded, flush-joint, polyvinyl chloride pipe. Attached to the bottom of the well casing will be a section of new threaded, flush-joint, 0.010-inch continuous wrap polyvinyl chloride well screen, approximately 10 to 20 feet long. The well will be installed so the well screen straddles the water table.

Soil samples for lithology will be collected every 5 feet to the total depth of the hole during hollow-stem auger drilling to provide a detailed lithologic log. The samples will be collected for lithology using a 24-inch-long, 2-inch-or-larger-diameter, split-spoon sampler. The soil borings will be logged in accordance with American Standard for Testing and Materials Method D 2488 using the Unified Soil Classification System. The soil samples will be screened in the field using a PID. The monitoring wells will be drilled, installed, and developed as specified in Section 4.8 and Appendix C of the SAP (IT, 2000a). The exact monitoring well locations will be determined in the field by the on-site geologist, based on actual field conditions.

4.3.4 Groundwater Sampling

Groundwater samples will be collected from the 41 monitoring wells completed at the CWM sites as presented in Section 4.3.3.

4.3.4.1 Sample Locations and Rationale

Groundwater samples will be collected from the monitoring well locations shown on Figures 4-1 through 4-9. The groundwater sampling rationale is listed in Table 4-1. The groundwater

Table 4-11

Groundwater Sample Designations and QA/QC Sample Quantities
Agent ID Area, Parcel 509(7)
Site Investigation at CWM Sites
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	Sample Matrix	Sample Depth (ft)	QA/QC Samples			Analytical Suite
				Field Duplicates	Field Splits	MS/MSD	
CWM-509-MW01	CWM-509-MW01-GW-TN3001-REG	Groundwater	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products
CWM-509-MW02	CWM-509-MW02-GW-TN3002-REG	Groundwater	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products
CWM-509-MW03	CWM-509-MW03-GW-TN3003-REG	Groundwater	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products
CWM-509-MW04	CWM-509-MW04-GW-TN3004-REG	Groundwater	a	CWM-509-MW04-GW-TN3005-FD			TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products

[a]Sample depth will depend on where sufficient first water is encountered to collect a water sample.

CWM - Chemical Warfare Material
FD - Field duplicate.
ft - Foot.
MS/MSD - Matrix spike/matrix spike duplicate.
QA/QC - Quality assurance/quality control.
REG - Field sample.
SVOC - Semivolatile organic compound.
TAL - Target analyte list.
TCL - Target compound list.
VOC - Volatile organic compound.

Table 4-12

Groundwater Sample Designations and QA/QC Sample Quantities
Training Area T-6, Parcel 183(6),
Site Investigation at CWM Sites
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	Sample Matrix	Sample Depth (ft)	QA/QC Samples			Analytical Suite
				Field Duplicates	Field Splits	MS/MSD	
CWM-183-MW01	CWM-183-MW01-GW-TG3001-REG	Groundwater	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products
CWM-183-MW02	CWM-183-MW02-GW-TG3002-REG	Groundwater	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products
CWM-183-MW03	CWM-183-MW03-GW-TG3003-REG	Groundwater	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products
CWM-183-MW04	CWM-183-MW04-GW-TG3004-REG	Groundwater	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products
CWM-183-MW05	CWM-183-MW05-GW-TG3005-REG	Groundwater	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products
CWM-183-MW06	CWM-183-MW06-GW-TG3006-REG	Groundwater	a	CWM-183-MW06-GW-TG3007-FD	CWM-183-MW06-GW-TG3008-FS		TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products
CWM-183-MW07	CWM-183-MW07-GW-TG3009-REG	Groundwater	a			CWM-183-MW07-GW-TG3009-MS/MSD	TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products
CWM-183-MW08	CWM-183-MW08-GW-TG30010-REG	Groundwater	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products

[a]Sample depth will depend on where sufficient first water is encountered to collect a water sample.

CWM - Chemical Warfare Material
ft - Foot.
MS/MSD - Matrix spike/matrix spike duplicate.
QA/QC - Quality assurance/quality control.
FD - Field duplicate.
FS - Field split.
REG - Field sample.
SVOC - Semivolatile organic compound.
TAL - Target analyte list.
TCL - Target compound list.
VOC - Volatile organic compound.

Table 4-13

Groundwater Sample Designations and QA/QC Sample Quantities
Blacktop Training Area and Fenced Yard, Parcels 511(7) and 512(7)
Site Investigation at CWM Sites
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	Sample Matrix	Sample Depth (ft)	QA/QC Samples			Analytical Suite
				Field Duplicates	Field Splits	MS/MSD	
CWM-511-MW01	CWM-511-MW01-GW-TP3001-REG	Groundwater	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products
CWM-511-MW02	CWM-511-MW02-GW-TP3002-REG	Groundwater	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products
CWM-511-MW03	CWM-511-MW03-GW-TP3003-REG	Groundwater	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products
CWM-512-MW01	CWM-512-MW01-GW-TPP3001-REG	Groundwater	a	CWM-512-MW01-GW-TPP3002-FD			TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products

[a]Sample depth will depend on where sufficient first water is encountered to collect a water sample.

FD - Field duplicate.
CWM - Chemical Warfare Material
ft - Foot.
MS/MSD - Matrix spike/matrix spike duplicate.
QA/QC - Quality assurance/quality control.
REG - Field sample.
SVOC - Semivolatile organic compound.
TAL - Target analyte list.
TCL - Target compound list.
VOC - Volatile organic compound.

Table 4-14

Groundwater Sample Designations and QA/QC Sample Quantities
Dog Training Area and Dog Kennel Area, Parcels 513(7) and 516(7)
Site Investigation at CWM Sites
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	Sample Matrix	Sample Depth (ft)	QA/QC Samples			Analytical Suite
				Field Duplicates	Field Splits	MS/MSD	
CWM-513-MW01	CWM-513-MW01-GW-TR3001-REG	Groundwater	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products
CWM-513-MW02	CWM-513-MW02-GW-TR3002-REG	Groundwater	a			CWM-513-MW02-GW-TR3002-MS/MSD	TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products
CWM-516-MW01	CWM-516-MW01-GW-TRR3001-REG	Groundwater	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products
CWM-516-MW02	CWM-516-MW01-GW-TRR3002-REG	Groundwater	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products

[a]Sample depth will depend on where sufficient first water is encountered to collect a water sample.

ft. - Foot
CWM - Chemical Warfare Material
MS/MSD - Matrix spike/matrix spike duplicate.
QA/QC - Quality assurance/quality control.
REG - Field sample.
VOC - Volatile organic compound.
SVOC - Semivolatile organic compound.
TAL - Target analyte list.
TCL - Target compound list.

Table 4-15

Groundwater Sample Designations and QA/QC Sample Quantities
Training Area T-5, Parcel 182(7)
Site Investigation at CWM Sites
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	Sample Matrix	Sample Depth (ft)	QA/QC Samples			Analytical Suite
				Field Duplicates	Field Splits	MS/MSD	
CWM-182-MW01	CWM-182-MW01-GW-TE3001-REG	Groundwater	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products
CWM-182-MW02	CWM-182-MW02-GW-TE3002-REG	Groundwater	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products
CWM-182-MW03	CWM-182-MW03-GW-TE3003-REG	Groundwater	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products
CWM-182-MW04	CWM-182-MW04-GW-TE3004-REG	Groundwater	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products
CWM-182-MW05	CWM-182-MW05-GW-TE3005-REG	Groundwater	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products
CWM-182-MW06	CWM-182-MW06-GW-TE3006-REG	Groundwater	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products

[a]Sample depth will depend on where sufficient first water is encountered to collect a water sample.

CWM - Chemical Warfare Material
ft - Foot.
MS/MSD - Matrix spike/Matrix spike duplicate.
QA/QC - Quality assurance/quality control.
REG - Field sample.
SVOC - Semivolatile organic compound.
TAL - Target analyte list.
TCL - Target compound list.
VOC - Volatile organic compound.

Table 4-16

Groundwater Sample Designations and QA/QC Sample Quantities
Former Detection and Identification Area, Parcel 180(7)
Site Investigation at CWM Sites
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	Sample Matrix	Sample Depth (ft)	QA/QC Samples			Analytical Suite
				Field Duplicates	Field Splits	MS/MSD	
CWM-180-MW01	CWM-180-MW01-GW-TK3001-REG	Groundwater	a			CWM-180-MW01-GW-TK3001-MS/MSD	TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products
CWM-180-MW02	CWM-180-MW02-GW-TK3002-REG	Groundwater	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products
CWM-180-MW03	CWM-180-MW03-GW-TK3003-REG	Groundwater	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products
CWM-180-MW04	CWM-180-MW04-GW-TK3004-REG	Groundwater	a	CWM-180-MW04-GW-TK3005-FD	CWM-180-MW04-GW-TK3006-FS		TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products

[a]Sample depth will depend on where sufficient first water is encountered to collect a water sample.

CWM - Chemical Warfare Material
ft - Foot.
MS/MSD - Matrix spike/matrix spike duplicate.
QA/QC - Quality assurance/quality control.
FD - Field duplicate.
FS - Field split.
REG - Field sample.
SVOC - Semivolatile organic compound.
TAL - Target analyte list.
TCL - Target compound list.
VOC - Volatile organic compound.

Table 4-17

Groundwater Sample Designations and QA/QC Sample Quantities
Old Burn Pit, Parcel 514(7)
Site Investigation at CWM Sites
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	Sample Matrix	Sample Depth (ft)	QA/QC Samples			Analytical Suite
				Field Duplicates	Field Splits	MS/MSD	
CWM-514-MW01	CWM-514-MW01-GW-TT3001-REG	Groundwater	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products
CWM-514-MW02	CWM-514-MW02-GW-TT3002-REG	Groundwater	a			CWM-514-MW02-GW-TT3002-MS/MSD	TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products
CWM-514-MW03	CWM-514-MW03-GW-TT3003-REG	Groundwater	a	CWM-514-MW03-GW-TT3004-FD	CWM-514-MW03-GW-TT3005-FS		TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products

[a]Sample depth will depend on where sufficient first water is encountered to collect a water sample.

CWM - Chemical Warfare Material
ft - Foot.
MS/MSD - Matrix spike/matrix spike duplicate.
QA/QC - Quality assurance/quality control.
FD - Field duplicate.
FS - Field split.
REG - Field sample.
SVOC - Semivolatile organic compound.
TAL - Target analyte list.
TCL - Target compound list.
VOC - Volatile organic compound.

Table 4-18

Groundwater Sample Designations and QA/QC Sample Quantities
CBR Proficiency Area, Parcel 517(7)
Site Investigation at CWM Sites
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	Sample Matrix	Sample Depth (ft)	QA/QC Samples			Analytical Suite
				Field Duplicates	Field Splits	MS/MSD	
CWM-517-MW01	CWM-517-MW01-GW-TV3001-REG	Groundwater	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products
CWM-517-MW02	CWM-517-MW02-GW-TV3002-REG	Groundwater	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products
CWM-517-MW03	CWM-517-MW03-GW-TV3003-REG	Groundwater	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products
CWM-517-MW04	CWM-517-MW04-GW-TV3004-REG	Groundwater	a	CWM-517-MW04-GW-TV3005-FD	CWM-517-MW04-GW-TV3006-FS		TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products

[a]Sample depth will depend on where sufficient first water is encountered to collect a water sample.

FD - Field duplicate.
CWM - Chemical Warfare Material
FS - Field split.
ft - Foot.
MS/MSD - Matrix spike/matrix spike duplicate.
QA/QC - Quality assurance/quality control.
REG - Field sample.
SVOC - Semivolatile organic compound.
TAL - Target analyte list.
TCL - Target compound list.
VOC - Volatile organic compound.

Table 4-19

Groundwater Sample Designations and QA/QC Sample Quantities
Old Toxic Training Area, Parcel 188(7)
Site Investigation at CWM Sites
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	Sample Matrix	Sample Depth (ft)	QA/QC Samples			Analytical Suite
				Field Duplicates	Field Splits	MS/MSD	
CWM-188-MW01	CWM-188-MW01-GW-TM3001-REG	Groundwater	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products
CWM-188-MW02	CWM-188-MW02-GW-TM3002-REG	Groundwater	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products
CWM-188-MW03	CWM-188-MW03-GW-TM3003-REG	Groundwater	a	CWM-188-MW03-GW-TM3004-FD	CWM-188-MW03-GW-TM3005-FS		TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products
CWM-188-MW04	CWM-188-MW04-GW-TM3006-REG	Groundwater	a			CWM-188-MW04-GW-TM3006-MS/MSD	TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products

[a]Sample depth will depend on where sufficient first water is encountered to collect a water sample.

CWM - Chemical Warfare Material
ft - Foot.
MS/MSD - Matrix spike/matrix spike duplicate.
QA/QC - Quality assurance/quality control.
FD - Field duplicate.
FS - Field split.
REG - Field sample.
SVOC - Semivolatile organic compound.
TAL - Target analyte list.
TCL - Target compound list.
VOC - Volatile organic compound.

sample designations, depths, and required QA/QC sample quantities are listed in Tables 4-11 through 4-19.

4.3.4.2 Sample Collection

Prior to sampling monitoring wells, static water levels will be measured from each of the 41 monitoring wells installed at the site to define the groundwater flow in the residuum aquifer. Water level measurements will be performed as outlined in Section 4.18 of the SAP (IT, 2000a). Groundwater samples will be collected in accordance with the procedures outlined in Section 4.9.1.4 of the SAP.

Sample documentation and chain-of-custodies will be recorded as specified in Section 4.13 of the SAP. Sample containers, sample volumes, preservatives, and holding times for the analyses required in this SFSP are listed in Section 5.0, Table 5-1 of the QAP (IT, 2000a). The samples will be analyzed for the parameters listed in Section 4.6 of this SFSP.

4.3.5 Surface Water Sampling

Seventeen surface water samples will be collected from five of the CWM sites. Six surface water samples will be collected from Training Area T-5, Parcel 182(7). Three surface water samples will be collected from Training Area T-6, Parcel 183(6). Three surface water samples will be collected from the Blacktop Training Area, Parcel 511(7). Two surface water samples will be collected from the Dog Training Area, Parcel 513(7). Also, three surface water samples will be collected from the CBR Proficiency Area, Parcel 517(7).

4.3.5.1 Sample Locations and Rationale

The surface water sampling rationale are listed in Table 4-1. The surface water samples will be collected from the proposed locations on Figures 4-2, 4-3, 4-4, 4-5 and 4-8. The surface water sample designations and required QA/QC sample requirements are listed in Table 4-20. The exact sampling locations will be determined in the field by the ecological sampler, based on drainage pathways and actual field observations.

4.3.5.2 Sample Collection

The surface water samples will be collected in accordance with the procedures specified in Section 4.9.1.3 of the SAP (IT, 2000a). Sample documentation and chain-of-custodies will be recorded as specified in Section 4.13 of the SAP. Sample containers, sample volumes, preservatives, and holding times for the analyses required in this SFSP are listed in Section 5.0, Table

Table 4-20

Surface Water and Sediment Sample Designations and QA/QC Sample Quantities
Parcels 182(7), 183(6), 511(7), 513(7), and 517(7)
Site Investigation at CWM Sites
Fort McClellan, Alabama

Sample Location	Sample Designation	Sample Matrix	Sample Depth (ft)	QA/QC Samples			Analytical Suite
				Field Duplicates	Field Splits	MS/MSD	
CWM-182-SW/SD01	CWM-182-SW/SD01-SW-TE2001-REG	Surface Water	N/A			CWM-182-SW/SD01-SW-TE2001-MS/MSD	TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products
	CWM-182-SW/SD01-SD-TE1001-REG	Sediment	0-0.5			CWM-182-SW/SD01-SD-TE1001-MS/MSD	(Also, TOC, Grain Size for sediment only)
CWM-182-SW/SD02	CWM-182-SW/SD02-SW-TE2002-REG	Surface Water	N/A				TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products
	CWM-182-SW/SD02-SD-TE1002-REG	Sediment	0-0.5				(Also, TOC, Grain Size for sediment only)
CWM-182-SW/SD03	CWM-182-SW/SD03-SW-TE2003-REG	Surface Water	N/A				TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products
	CWM-182-SW/SD03-SD-TE1003-REG	Sediment	0-0.5				(Also, TOC, Grain Size for sediment only)
CWM-182-SW/SD04	CWM-182-SW/SD04-SW-TE2004-REG	Surface Water	N/A				TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products
	CWM-182-SW/SD04-SD-TE1004-REG	Sediment	0-0.5				(Also, TOC, Grain Size for sediment only)
CWM-182-SW/SD05	CWM-182-SW/SD05-SW-TE2005-REG	Surface Water	N/A				TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products
	CWM-182-SW/SD05-SD-TE1005-REG	Sediment	0-0.5				(Also, TOC, Grain Size for sediment only)
CWM-182-SW/SD06	CWM-182-SW/SD06-SW-TE2006-REG	Surface Water	N/A	CWM-182-SW/SD06-SW-TE2007-FD	CWM-182-SW/SD06-SW-TE2008-FD		TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products
	CWM-182-SW/SD06-SD-TE1006-REG	Sediment	0-0.5	CWM-182-SW/SD06-SD-TE1007-FD	CWM-182-SW/SD06-SD-TE1008-FS		(Also, TOC, Grain Size for sediment only)
CWM-183-SW/SD01	CWM-183-SW/SD01-SW-TG2001-REG	Surface Water	N/A				TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products
	CWM-183-SW/SD01-SD-TG1001-REG	Sediment	0-0.5				(Also, TOC, Grain Size for sediment only)
CWM-183-SW/SD02	CWM-183-SW/SD02-SW-TG2002-REG	Surface Water	NA	CWM-183-SW/SD02-SW-TG2003-FD	CWM-183-SW/SD02-SW-TG2004-FS		TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products
	CWM-183-SW/SD02-SD-TG1002-REG	Sediment	0-0.5	CWM-183-SW/SD02-SD-TG1003-FD	CWM-183-SW/SD02-SD-TG1004-FS		(Also, TOC, Grain Size for sediment only)
CWM-183-SW/SD03	CWM-183-SW/SD03-SW-TG2005-REG	Surface Water	NA				TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products
	CWM-183-SW/SD03-SD-TG1005-REG	Sediment	0-0.6				(Also, TOC, Grain Size for sediment only)

Table 4-20

Surface Water and Sediment Sample Designations and QA/QC Sample Quantities
Parcels 182(7), 183(6), 511(7), 513(7), and 517(7)
Site Investigation at CWM Sites
Fort McClellan, Alabama

Sample Location	Sample Designation	Sample Matrix	Sample Depth (ft)	QA/QC Samples			Analytical Suite
				Field Duplicates	Field Splits	MS/MSD	
CWM-511-SW/SD01	CWM-511-SW/SD01-SW-TP2001-REG	Surface Water	N/A				TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products (Also, TOC, Grain Size for sediment only)
	CWM-511-SW/SD01-SD-TP1001-REG	Sediment	0-0.5				
CWM-511-SW/SD02	CWM-511-SW/SD02-SW-TP2002-REG	Surface Water	NA				TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products (Also, TOC, Grain Size for sediment only)
	CWM-511-SW/SD02-SD-TP1002-REG	Sediment	0-0.5				
CWM-511-SW/SD03	CWM-511-SW/SD03-SW-TP2003-REG	Surface Water	NA				TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products (Also, TOC, Grain Size for sediment only)
	CWM-511-SW/SD03-SD-TP1003-REG	Sediment	0-0.6				
CWM-513-SW/SD01	CWM-513-SW/SD01-SW-TR2001-REG	Surface Water	N/A				TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products (Also, TOC, Grain Size for sediment only)
	CWM-513-SW/SD01-SD-TR1001-REG	Sediment	0-0.5				
CWM-513-SW/SD02	CWM-513-SW/SD02-SW-TR2002-REG	Surface Water	N/A				TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products (Also, TOC, Grain Size for sediment only)
	CWM-513-SW/SD02-SD-TR1002-REG	Sediment	0-0.6				
CWM-517-SW/SD01	CWM-517-SW/SD01-SW-TV2001-REG	Surface Water	N/A				TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products (Also, TOC, Grain Size for sediment only)
	CWM-517-SW/SD01-SD-TV1001-REG	Sediment	0-0.5				
CWM-517-SW/SD02	CWM-517-SW/SD02-SW-TV2002-REG	Surface Water	NA				TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products (Also, TOC, Grain Size for sediment only)
	CWM-517-SW/SD02-SD-TV1002-REG	Sediment	0-0.5				
CWM-517-SW/SD03	CWM-517-SW/SD03-SW-TV2003-REG	Surface Water	NA			CWM-517-SW/SD03-SW-TV2003-MS/MSD	TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products (Also, TOC, Grain Size for sediment only)
	CWM-517-SW/SD03-SD-TV1003-REG	Sediment	0-0.6			CWM-517-SW/SD03-SD-TV1003-MS/MSD	

ft - Foot
MS/MSD - Matrix spike/matrix spike duplicate.
NA - Not applicable.
QA/QC - Quality assurance/quality control.
REG - Field sample.
VOC - Volatile organic compound.
SVOC - Semivolatile organic compound.
TAL - Target analyte list.
TCL - Target compound list.
TOC - Total organic carbon.

5-1, of the QAP. The samples will be analyzed for the parameters listed in Section 4.6 of this SFSP.

4.3.6 Sediment Sampling

Seventeen sediment samples will be collected from five of the CWM sites. These sediment samples will be collected at the same locations as the surface water samples described in Section 4.3.5.

4.3.6.1 Sample Locations and Rationale

The proposed locations for the sediment samples are shown in Figures 4-2, 4-3, 4-4, 4-5, and 4-8. Sediment sampling rationale is presented in Table 4-1. The sediment sample designations and required QA/QC sample requirements are listed in Table 4-20. The actual sediment sample points will be at the discretion of the ecological sampler, based on the drainage pathways and actual field observations.

4.3.6.2 Sample Collection

The sediment samples will be collected in accordance with the procedures specified in Section 4.9.1.2 of the SAP. Sample documentation and chain of custody will be recorded as specified in Section 4.13 of the SAP. The sediment samples will be analyzed for the parameters listed in Section 4.6 of this SFSP.

4.4 Decontamination Requirements

Decontamination will be performed on sampling and nonsampling equipment to prevent cross-contamination between sampling locations. Decontamination of sampling equipment will be performed in accordance with the requirements presented in Section 4.10.1.1 of the SAP (IT, 2000a). Decontamination of nonsampling equipment will be performed in accordance with the requirements presented in Section 4.10.1.2 of the SAP.

4.5 Surveying of Sample Locations

Sampling locations will be marked with pin flags, stakes, and/or flagging and will be surveyed using either global positioning system (GPS) or conventional civil survey techniques, as necessary to obtain the required level of accuracy. Horizontal coordinates will be referenced to the U.S. State Plane Coordinate System, Alabama East Zone, North American Datum, 1983. Elevations will be referenced to the National Geodetic Vertical Datum of 1929 or the North American Vertical Datum of 1988 (soon to be established on site).

Horizontal coordinates for soil, sediment, and surface water locations will be recorded using a GPS to provide accuracy within 1 meter. Because of the need to use permanent monitoring wells to determine water levels, a higher level of accuracy is required. Monitoring wells will be surveyed to an accuracy of 0.1 foot for horizontal coordinates and 0.01 foot for elevations, using survey-grade GPS techniques and/or conventional civil survey techniques, as required. Procedures to be used for GPS surveying are described in Section 4.3 of the SAP. Conventional land survey requirements are presented in Section 4.19 of the SAP. All areas at this site must be cleared for UXO avoidance before any surveying activities will commence.

4.6 Analytical Program

Samples collected at locations specified in this chapter of this SFSP will be analyzed for the specific suites of chemicals and elements based on the history of site usage, as well as EPA, ADEM, FTMC, and USACE requirements. Target analyses for samples collected from the CWM sites, Parcels 509(7), 183(6), 511(7), 512(7), 513(7), 516(7), 182(7), 180(7), 514(7), 517(7), and 188(7), consist of the following list of analytical suites:

- Target compound list volatile organic compounds – Method 5035/8260B
- Target compound list semivolatile organic compounds – Method 8270C
- Target analyte list metals – Method 6010B/7000
- Chemical agent breakdown products- Methods 8270M/8321.

In addition, the sediment samples will be analyzed for the following list of parameters:

- Total organic carbon – Method 9060
- Grain size – American Society for Testing and Materials D-421/D-422.

The samples will be analyzed using EPA SW-846 methods, including Update III Methods where applicable, as presented in Table 4-21 in this SFSP and Table 6-1 in the QAP. Data will be reported and evaluated in accordance with CESAS Level B criteria (USACE, 1994) and the stipulated requirements for the generation of definitive data (Section 3.1.2 of the QAP). Chemical data will be reported via hard copy data packages by the laboratory using Contract Laboratory Program-like forms. These packages will be validated in accordance with EPA National Functional Guidelines by Level III criteria.

Table 4-21

Analytical Samples
SI at CWM Sites,
Parcels 509(7), 183(6), 511(7), 512(7), 513(7), 516(7), 182(7), 180(7), 514(7), 517(7), and 188(7)
Fort McClellan, Calhoun County, Alabama

				Field Samples			QA/QC Samples [a]					EMAX	QA Lab
Parameters	Analysis Method	Sample Matrix	TAT Needed	No. of Sample Points	No. of Events	No. of Field Samples	Field Dups (10%)	Splits w/ QA Lab (5%)	MS/MSD (5%)	Trip Blank (1/ship)	Eq. Rinse (1/wk/matrix)	Total No. Analysis	Total No. Analysis
CWM Sites: 58 water matrix samples (41 groundwater samples and 17 surface water samples); **103 soil matrix samples** (43 surface soil samples, 43 subsurface soil samples, 17 sediment samples)													
TCL VOCs	8260B	water	normal	58	1	58	6	3	2	15	5	88	3
TCL SVOCs	8270C	water	normal	58	1	58	6	3	2		5	73	3
Tot TAL Metals	6010B/7000	water	normal	58	1	58	6	3	2		5	73	3
CWM BD Products [b]	8270/8321	water	normal	58	1	58	6	3	2		5	73	3
TCL VOCs	8260B	soil	normal	103	1	103	10	5	5		5	128	5
TCL SVOCs	8270C	soil	normal	103	1	103	10	5	5		5	128	5
TAL Metals	6010B/7000	soil	normal	103	1	103	10	5	5		5	128	5
CWM BD Products [b]	8270/8321	soil	normal	103	1	103	10	5	5		5	128	5
TOC	9060	sediment	normal	17	1	17						17	0
Grain Size	ASTM D-421/D-422	sediment	normal	17	1	17						17	0
			CWM Sites:			678	64	32	28	15	40	853	32

[a] Field duplicate, QA split, and MS/MSD samples were calculated as a percentage of the field samples collected per site and were rounded to the nearest whole number. Trip blank samples will be collected in association with water matrix samples for VOC analysis only. Assumed four field samples per day to estimate trip blanks. Equipment blanks will be collected once per event whenever sampling equipment is field decontaminated and re-used. They will be repeated weekly for sampling events that are anticipated to last more than 1 week. Assumed 20 field samples will be collected per week to estimate number of equipment blanks.

[b] Chemical Warfare Material Breakdown Products - include Method 8270 (Modified): 1,4-oxathiane, 1,4-dithiane, p-chlorophenylmethylsulfoxide, p-chlorophenylmethylsulfone; Method 8321: thiodiglycol, IMPA, EMPA, MPA, DIMP, and DMMP.

Ship samples to:

EMAX Laboratories, Inc.
630 Maple Avenue
Torrance, California
Attn: Elizabeth McIntyre
Tel: 310-618-8889
Fax: 310-618-0818

USACE Laboratory split samples are shipped to:

U.S. Army Engineer District, Savannah
Environmental & Materials District
Attn: Sample Receiving
200 North Cobb Parkway
Building 400, Suite 404
Marietta, Georgia 30062
Tel: 678-354-0310

MS/MSD - Matrix spike/matrix spike duplicate.
PCB - Polychlorinated biphenyl.
QA/QC - Quality assurance/quality control.
VOC - Volatile organic compound.
SVOC - Semivolatile organic compound.
TAL - Target analyte list.
TCL - Target compound list.
TOC - Total organic carbon.
CWM - Chemical Warfare Material
BD - Breakdown
IMPA - Isopropylmethyl phosphonic acid
EMPA - Ethylmethyl phosphonic acid
MPA - Methyl phosphonic acid
DIMP - Di-isopropylmethylphosphonate
DMMP - Dimethylmethylphosphonate

4.7 Sample Preservation, Packaging, and Shipping

Sample preservation, packaging, and shipping will follow the procedures specified in Section 4.13.2 of the SAP (IT, 2000a). Completed analysis request/chain-of-custody records will be secured and included with each shipment of coolers to:

Attn: Elizabeth McIntyre
EMAX Laboratories, Inc.
630 Maple Avenue
Torrance, California 90503
Telephone: (310) 618-8889.

QA split samples collected for the USACE laboratory will be shipped to the following address:

U.S. Army Engineer District, Savannah
Environmental & Materials Unit
Attn: Sample Receiving
200 North Cobb Parkway
Building 400, Suite 404
Marietta, Georgia 30062
Telephone: (678) 354-0310.

4.8 Investigation-Derived Waste Management

Management and disposal of the investigation-derived wastes (IDW) will follow procedures and requirements as described in Appendix D of the SAP (IT, 2000a). The IDW expected to be generated at the CWM sites will include decontamination fluids and disposable personal protective equipment. The IDW will be staged in the fenced area surrounding Buildings 335 and 336 while awaiting final disposal.

4.9 Site-Specific Safety and Health

Health and safety requirements for this SI are provided in the SSHP attachment for the 11 CWM sites, Parcels 509(7), 183(6), 511(7), 512(7), 513(7), 516(7), 182(7), 180(7), 514(7), 517(7), and 188(7). The SSHP attachment will be used in conjunction with the installation-wide SHP.

5.0 Project Schedule

The project schedule for the SI activities will be provided by the IT project manager to the Base Realignment and Closure Cleanup Team and will be in accordance with the WP.

6.0 References

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ATTACHMENT 1

LIST OF ABBREVIATIONS AND ACRONYMS

List of Abbreviations and Acronyms

3D	3D International Environmental Group
Abs	skin absorption
AC	hydrogen cyanide
AcB2	Anniston and Allen gravelly loams, 2 to 6 percent slopes, eroded
AcC2	Anniston and Allen gravelly loams, 6 to 10 percent slopes, eroded
AcD2	Anniston and Allen gravelly loams, 10 to 15 percent slopes, eroded
AcE2	Anniston and Allen gravelly loams, 15 to 25 percent slopes, eroded
ACGIH	American Conference of Governmental Industrial Hygienists
ADEM	Alabama Department of Environmental Management
AEL	airborne exposure limit
AL	Alabama
amb.	amber
ANAD	Anniston Army Depot
APT	armor-piercing tracer
ASP	Ammunition Supply Point
ASR	Archives Search Report
AST	aboveground storage tank
ASTM	American Society for Testing and Materials
B	analyte detected in laboratory or field blank at concentration greater than the reporting limit (and greater than zero)
BCT	BRAC Cleanup Team
BFB	bromofluorobenzene
bgs	below ground surface
bkg	background
bls	below land surface
BOD	biological oxygen demand
BRAC	Base Realignment and Closure
Braun	Braun Intertec Corporation
BTEX	benzene, toluene, ethylbenzene, and xylenes
BTOC	below top of casing
BZ	breathing zone; 3-quinuclidinyl benzilate
C	ceiling limit value
Ca	carcinogen
CCAL	continuing calibration
CCB	continuing calibration blank
CD	compact disc
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERFA	Community Environmental Response Facilitation Act
CESAS	Corps of Engineers South Atlantic Savannah
CFC	chlorofluorocarbon
CG	cyanogen chloride
ch	inorganic clays of high plasticity
CK	carbonyl chloride
cl	inorganic clays of low to medium plasticity
Cl.	chlorinated
CLP	Contract Laboratory Program
CN	chloroacetophenone
CNB	chloroacetophenone, benzene, and carbon tetrachloride
CNS	chloroacetophenone, chloropicrin, and chloroform
COC	chain of custody
COE	Corps of Engineers
Con	skin or eye contact
CRL	certified reporting limit
CRZ	contamination reduction zone
CS	ortho-chlorobenzylidene-malononitrile
CSEM	conceptual site exposure model
ctr.	container
CWA	chemical warfare agent
CWM	chemical warfare material; clear, wide mouth
CX	dichloroformoxime
D	duplicate
DANC	decontamination agent, non-corrosive
ºC	degrees Celsius
ºF	degrees Fahrenheit
DDT	dichlorodiphenyltrichloroethane
DEP	depositional soil
DI	deionized
DIMP	di-isopropylmethylphosphonate
DMMP	dimethylmethylphosphonate
DOD	U.S. Department of Defense
DP	direct-push
DPDO	Defense Property Disposal Office
DQO	data quality objective
DRMO	Defense Reutilization and Marketing Office
DRO	diesel range organics
DS	deep (subsurface) soil
DS2	Decontamination Solution Number 2
E&E	Ecology and Environment, Inc.
EBS	environmental baseline survey
Elev.	elevation
EM	electromagnetic
EM31	Geonics Limited EM31 Terrain Conductivity Meter
EM61	Geonics Limited EM61 High-Resolution Metal Detector
EOD	explosive and ordnance disposal
EODT	explosive and ordnance disposal team
EPA	U.S. Environmental Protection Agency
EPC	exposure point concentration
EPIC	Environmental Photographic Interpretation Center
ER	equipment rinsate
ESE	Environmental Science and Engineering, Inc.
ESV	ecological screening value
Exp.	explosives
E-W	east to west
EZ	exclusion zone
FB	field blank
FD	field duplicate
FedEx	Federal Express, Inc.
FFE	field flame expedient
Fil	filtered
Flt	filtered
FMP 1300	Former Motor Pool 1300
Frtn	fraction
FS	field split
ft	feet
ft/ft	feet per foot
FTA	Fire Training Area
FTMC	Fort McClellan
g	gram
G-856	Geometrics, Inc. G-856 magnetometer
G-858G	Geometrics, Inc. G-858G magnetic gradiometer
gal	gallon
gal/min	gallons per minute
GB	sarin
gc	clay gravels; gravel-sand-clay mixtures
GC	gas chromatograph
GC/MS	gas chromatograph/mass spectrometer
GFAA	graphite furnace atomic absorption
gm	silty gravels; gravel-sand-silt mixtures
gp	poorly graded gravels; gravel-sand mixtures
gpm	gallons per minute
GPR	ground-penetrating radar
GPS	global positioning system
GS	ground scar
GSBP	Ground Scar Boiler Plant
GSSI	Geophysical Survey Systems, Inc.
GST	ground stain
GW	groundwater
gw	well-graded gravels; gravel-sand mixtures
HA	hand auger
HCl	hydrochloric acid
HD	distilled mustard
HDPE	high-density polyethylene
Herb.	herbicides
HNO_3	nitric acid
hr	hour
H&S	health and safety
HSA	hollow-stem auger
HTRW	hazardous, toxic, and radioactive waste
I	out of control, data rejected due to low recovery
ICAL	initial calibration
ICB	initial calibration blank
ICP	inductively-coupled plasma
ICS	interference check sample
ID	inside diameter
IDL	instrument detection limit

List of Abbreviations and Acronyms (Continued)

IDLH	immediately dangerous to life or health
IDW	investigation-derived waste
IMPA	isopropylmethyl phosphonic acid
in.	inch
Ing	ingestion
Inh	inhalation
IP	ionization potential
IPS	International Pipe Standard
IRDMIS	Installation Restoration Data Management Information System
IT	IT Corporation
ITEMS	IT Environmental Management System ™
J	estimated concentration
JeB2	Jefferson gravelly fine sandy loam, 2 to 6 percent slopes, eroded
JeC2	Jefferson gravelly fine sandy loam, 6 to 10 percent slopes, eroded
JfB	Jefferson stony fine sandy loam, 0 to 10 percent slopes have strong slopes
K	conductivity
L	lewisite; liter
LC_{50}	lethal concentration for 50 percent of population tested
LD_{50}	lethal dose for 50 percent of population tested
l	liter
LCS	laboratory control sample
LEL	lower explosive limit
LT	less than the certified reporting limit
max	maximum
MDL	method detection limit
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
mg/m^3	milligrams per cubic meter
mh	inorganic silts, micaceous or diatomaceous fine, sandy or silt soils
MHz	megahertz
µg/g	micrograms per gram
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
µmhos/cm	micromhos per centimeter
min	minimum
MINICAMS	miniature continuous air sampling system
ml	inorganic silts and very fine sands
mL	milliliter
mm	millimeter
MM	mounded material
MOGAS	motor vehicle gasoline
MPA	methyl phosphonic acid
MR	molasses residue
MS	matrix spike
mS/cm	millisiemens per centimeter
MSD	matrix spike duplicate
msl	mean sea level
MtD3	Montevallo shaly, silty clay loam, 10 to 40 percent slopes , severely eroded
mV	millivolts
MW	monitoring well
N/A	not applicable; not available
NAD	North American Datum
NAD83	North American Datum of 1983
NAVD88	North American Vertical Datum of 1988
ND	not detected
NE	no evidence
NFA	No Further Action
ng/L	nanograms per liter
NGVD	National Geodetic Vertical Datum
NIC	notice of intended change
NIOSH	National Institute for Occupational Safety and Health
No.	number
NOAA	National Oceanic and Atmospheric Administration
NR	not requested
ns	nanosecond
N-S	north to south
nT	nanotesla
NTU	nephelometric turbidity unit
O&G	oil and grease
OD	outside diameter
OE	ordnance and explosives
oh	organic clays of medium to high plasticity
ol	organic silts and organic silty clays of low plasticity
OP	organophosphorus
OSHA	Occupational Safety and Health Administration
OWS	oil/water separator
oz	ounce
PAH	polynuclear aromatic hydrocarbon
Pb	lead
PCB	polychlorinated biphenyl
PCE	perchloroethene
PDS	Personnel Decontamination Station
PEL	permissible exposure limit
Pest.	pesticide
PG	professional geologist
PID	photoionization detector
PkA	Philo and Stendal soils local alluvium, 0 to 2 percent slopes
POL	petroleum, oils, and lubricants
PP	peristaltic pump
ppb	parts per billion
PPE	personal protective equipment
ppm	parts per million
PPMP	Print Plant Motor Pool
ppt	parts per thousand
PSSC	potential site-specific chemical
pt	peat or other highly organic silts
PVC	polyvinyl chloride
QA	quality assurance
QA/QC	quality assurance/quality control
QAP	installation-wide quality assurance plan
QC	quality control
QST	QST Environmental Inc.
qty	quantity
Qual	qualifier
R	rejected
RCRA	Resource Conservation and Recovery Act
ReB3	Rarden silty clay loams
REG	field sample
REL	recommended exposure limit
RFA	request for analysis
RI	remedial investigation
RL	reporting limit
RPD	relative percent difference
RRF	relative response factor
RSD	relative standard deviation
RTK	real-time kinematic
SAD	South Atlantic Division
SAE	Society of Automotive Engineers
SAIC	Science Applications International Corporation
SAP	installation-wide sampling and analysis plan
sc	clayey sands; sand-clay mixtures
Sch.	schedule
SD	sediment
SDG	sample delivery group
SDZ	safe distance zone; surface danger zone
SEMS	Southern Environmental Management & Specialties
SFSP	site-specific field sampling plan
SGF	standard grade fuels
SHP	installation-wide safety and health plan
SI	site investigation
SL	standing liquid
sm	silty sands; sand-silt mixtures
SOP	standard operating procedure
sp	poorly graded sands; gravelly sands
SP	sump pump
Ss	stony rough land, sandstone series
SS	surface soil
SSC	site-specific chemical
SSHO	site safety and health officer
SSHP	site-specific safety and health plan
SSSL	site-specific screening level
STB	supertropical bleach
STEL	short-term exposure limit

STOLS	Surface Towed Ordnance Locator System®
Std. units	standard units
SU	standard unit
SVOC	semivolatile organic compound
SW	surface water
SW-846	U.S. EPA *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*
SZ	support zone
TAL	target analyte list
TAT	turn around time
TB	trip blank
TCE	trichloroethene
TCL	target compound list
TCLP	toxicity characteristic leaching procedure
TDGCL	thiodiglycol
TDGCLA	thiodiglycol chloroacetic acid
TERC	Total Environmental Restoration Contract
TIC	tentatively identified compounds
TLV	threshold limit value
TN	Tennessee
TOC	top of casing, total organic carbon
TPH	total petroleum hydrocarbons
TRADOC	U.S. Army Training and Doctrine Command
TRPH	total recoverable petroleum hydrocarbons
TWA	time weighted average
UCL	upper confidence limit
UCR	upper certified range
UJ	not detected above reporting limit; result should be estimated
USACE	U.S. Army Corps of Engineers
USAEC	U.S. Army Environmental Center
USAEHA	U.S. Army Environmental Hygiene Agency
USAMCLS	U.S. Army Chemical School
USATEU	U.S. Army Technical Escort Unit
USATHAMA	U.S. Army Toxic and Hazardous Material Agency
USCS	Unified Soil Classification System
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
UST	underground storage tank
UXO	unexploded ordnance
VOA	volatile organic analyte
VOC	volatile organic compound
VOH	volatile organic hydrocarbon
VQlfr	validation qualifier
VQual	validation qualifier
VX	nerve agent (O-ethyl-S- [diisoproplaminoethyl]-methylphosphonothiolate)
Weston	Roy F. Weston, Inc.
WP	installation-wide work plan
WS	watershed
WSA	Watershed Screening Assessment
WWI	World War I
WWII	World War II
XRF	x-ray fluorescence
yd^3	cubic yards

APPENDIX A

MINICAMS SCREENING PROCEDURE

MINICAMS Screening Procedure[a]

The Miniature Continuous Air Monitoring System (MINICAMS) units were operated by two U.S. Army Technical Escort Unit (USATEU) teams according to their Standard Operating Procedure (SOP). The MINICAMS units obtain a time weighted average (TWA) concentration by analyzing vapors produced by thermal desorption from a soil sample. The thermal desorption was effected by heating each sample to approximately 70 degrees Fahrenheit (°F) in a controlled environment. The relationship between the concentration of chemical warfare agent (CWA) detected in the desorbed vapor sample and the concentration of CWA contained in the soil is variable and depends on the lithology, moisture content, and pH of the soil sample. In general, more CWA vapor is recovered from coarse soils than from fine-grained soils at an optimum moisture content that varies with soil type (Sage and Howard, 1989). TWA concentrations for distilled mustard (HD), sarin (GB), and nerve agent (VX) are established by the Surgeon General of the United States and are shown below:

Agent	TWA* (mg/m^3)	TWA* (ng/L)	MINICAMS Detection Limit* (relative units)
HD	.003	3	1
GB	.0001	0.1	.005
VX	.00001	0.01	.005

*Data provided by CMS Research Corporation (1993, written communication SAIC, 1995).

The MINICAMS system is normally set up to report concentrations in relative units. For example, if a concentration of 0.003 milligrams per cubic meter (mg/m^3) of HD is detected by the MINICAMS, it is reported as 1.00 TWA in relative units. If a concentration of 0.00001 mg/m^3 of VX is detected, it is reported as 1.00 TWA. Thus, the TWA reading has the same significance no matter which agent is being detected. The TWA reading reported for a given agent may be converted to mg/m^3 simply by multiplying the reported TWA reading by the definition given above. For example, a reading of 0.5 TWA for GB corresponds to 0.00005 mg/m^3.

Ideally, the unit will report a concentration reading of 1.00 TWA each time the proper quantity of agent is injected into the MINICAMS after calibration. The alarm level for the MINICAMS is set to correspond to a 95 percent confidence level, which would sound an alarm if the instrument was challenged with the equivalent of 1.00 TWA of agent. Statistical studies have shown that an alarm level of 0.80 TWA is a suitable setpoint for the MINICAMS to achieve a 95

percent confidence level. A 1.00 TWA challenge of the MINICAMS will result in a concentration reading greater than or equal of 0.80, 95 percent of the time, resulting in an alarm.

The following procedure was used to analyze soil samples using a MINICAMS unit at Fort McClellan:

- Approximately 50 grams of soil were collected with a decontaminated stainless-steel spoon trowel, or hand auger; deposited into a stainless-steel bowl; homogenized; and placed into a glass jar. Upon retrieval of a split-spoon sample, the soil in the tip of the sampler was removed with a stainless-steel spoon and placed into a glass jar.

- The soil sample was placed into the heater box (uncapped) and heated to the required minimum temperature of 70°F. Evolved vapors were collected through Teflon™ tubing attached to the heater box and were introduced directly into the MINICAMS unit. Once the MINICAMS reported the sample clear of CWA, the soil sample was removed, disposed of onsite, and the results logged by USATEU. Each sample was equilibrated in the heater box at the same temperature, for the same duration, and with approximately equal volume in each soil sample container.

- USATEU also conducted continuous air monitoring with the MINICAMS units during intrusive activities (i.e., drilling and trenching). The heater lines were placed as close to the borehole or test pit as conditions allowed. The soil vapors released by the intrusive activity were purged through the heater lines, adsorbed onto the trap, and desorbed into the column of the MINICAMS. The results of each cycle were logged by USATEU.

G.W. Sage and P.H. Howard, 1989, ***Environmental Fate Assessments of Chemical Agents HD and VX,*** Chemical Research, Development, and Engineering Center, U.S. Army Armament Munitions Chemical Compound, CRDEC-CR-034, p. 33, June.

Science Applications International Corporation, 1995, ***Draft Fort McClellan Remedial Investigation Report***, August.